

COMPUTERWORLD

\$2.00 A COPY; \$44/YEAR

MAY 6, 1985

VOL. XX, NO. 18

Starts today
Comdex/Spring
'85 previewed/18

In Depth
New partners
in information
10/1

In Depth
Part 2:
Primer for friends
and lovers/10/7

Technology yields banks slim return on investment

By Charles Babcock
Civ New York Bureau

NEW YORK — Banking institutions invested heavily in high technology at the end of the 1970s, but no bank or group of banks emerged with a competitive advantage as a result.

That is the conclusion reached by the Big Eight accounting firm of Touche Ross & Co. in a recent survey of executives at 209 banks worldwide.

Spokesmen for the New York management consulting firm declined to speculate on what would have happened if a bank had not invested in technology during that period. Instead, they said technology costs to banks were higher than anticipated without yielding any long-term competitive advantage.

Even Citibank N.A. here, recognized as having gained a consumer market share through its early use of automated teller machines, has found costs ris-

ing in step with new revenue.

"There is no bank that has grown significantly and kept costs down," said Jack Shaw, a Touche Ross senior consultant.

The survey reported disappointment on the part of many senior executives at major banks, including 50 in the U.S., that computerization had not yielded more bottom-line benefits.

The Touche Ross researchers said, however, that banks' spending on technology will not slacken. Rather it will "increase sharply between now and 1990" because of the competitive pressures of international banking, they reported.

At the same time, senior bank executives will try to improve the investment's contribution to bank profits by linking new technology more closely to marketing plans, Shaw said.

In the case of automated teller ma-

See BANKING page 8

Bypass cost, payback have users wary

Lost in a series on corporate bypass strategies.

By John Die
Civ Staff

Although some companies already benefit from communications bypass technologies, many users are not sold on the idea because of high up-front costs and fear of being locked in by the systems.

Users interviewed said they are continually surveying bypass technology with an eye toward fluctuating common-carrier rates and service options. Some said, however, that their geographically dispersed networks made bypassing standard telephone facilities impractical.

While cost is the factor most commonly used to justify bypass systems, it is not the only consideration users cited. The lead time associated with common-carrier circuit installation is a key motivation for bypass, according to Roland W. Sprague, director of communications planning and engineering for American Airlines.

"There are probably some savings to be gained by doing it, but the problem is getting service in a timely fashion and gaining control of escalating expense," he said.

American Airlines is stepping carefully, given the economics of the situation. "We're skeptical about going out and doing anything major right now because rates and tariff filings are being battered around, and things are not unstable," Sprague said.

This flux, coupled with high up-front equipment costs, often makes it hard to cost-justify bypass systems within a permissible payback period.

"If a bypass system has a straight five-year payback, the investment would be questionable with all the dynamics in the industry right

See BYPASS page 8

TOP OF THE NEWS

Line, we hardly knew ya. Apple Computer will cease production of its once-vaunted microcomputer. Page 2.

From tape to cartridge in three months. An early user of IBM's 3480 tape drive converted about 70,000 3480 reel-to-reel files to the 3480 cassette format in three months. Page 8.

Xerox and Compaq rolled out the minis, the former unveiling a series of five IBM-compatible machines and the latter a line of portable IBM Personal Computer AT compatibles. Page 13-18.

Applied Data Research offered IBM IMS and DL/I users another pathway to relational data base management system technology by introducing automated migration software. Page 14.

A flake for the effort. Phillippe Kahn, founder of Borland International,



has gone from a garage office to the big time in two years. Page 21.

FYI

Out of work at 46, manager sets DP skills on new course

By Charles Babcock
Civ New York Bureau

After 25 years in MIS, David H. Dorbandt had come to see computer managers as agents of change.

They continually needed foresight and adaptability to help others adjust to technology within their companies.

Now Dorbandt, 46, finds he needs all of his resourcefulness to cope with a change that has affected him more than many of his coworkers. It required him to cease representing his company and begin representing himself, a middle-aged man looking for a job.

On Feb. 4, Hoffmann-La Roche, Inc., the Nutley, N.J., pharmaceutical company where Dorbandt worked for 19 years, announced it was cutting its staff by 1,000 employees because its patent on the drug Valium was due to expire and major revenue cuts were expected. Particularly hard hit was the systems development side of MIS, former employees of the department claimed. Dorbandt was a

See DORBANDT page 6

A look at tomorrow today

In this issue, *Computerworld* introduces Update, a monthly special section focusing on a series of management and technical issues of current and future interest to you, the reader.

Update aims to look at the near-term implications of future technologies as well as the critical management issues facing DP departments today.

The inaugural section of Update, titled "Toward the fifth generation," follows page 50 and provides a comprehensive look at the next-generation of technology. AI, expert systems, supercomputers, parallel processing and the race between the U.S. and Japan for the lead in these technologies are among the areas covered.

In June, Update will focus on recruiting and keeping a DP staff.

COMPUTER
UNIVERSITY MICROFILMS
SERIALS ACQUISITIONS
300 N. ZEEB RD
ANN ARBOR MI 48106

NEWSPAPER

Random access

Industry sources said the strong U.S. dollar in international currency markets is resulting in a tremendous flow of European-manufactured IBM mainframes into the U.S. third-party market. Leasing firms are buying new and used mainframes in relatively inexpensive European currencies and shipping them to the U.S. One independent observer said IBM is winking at that practice but may come down hard on a European firm caught buying discounted new equipment from West German educational institutions and shipping it here for resale.

Tandem Computers, Inc. is already developing a successor to its recently introduced Nonstop EXT, according to sources close to the company. Like EXT, the follow-up machine will preserve Tandem's existing architecture and will be aimed at users in the branch or district offices of large corporations. But Checkmate, as the unnamed CPU is known internally, will be implemented in gate arrays — a technology not now present in Tandem processors.

Data arrays will also form the technological base for a second processor model now under development within Tandem Computers, Inc., according to an analyst who follows the vendor closely. Continuing with its chess theme, Tandem has reportedly nicknamed the second processor Check and intends for the system to be a replacement for its current top-of-the-line mainframe, the Nonstop TXP. Check is said to be slated for introduction early next year.

Plan-busting talks have begun in the computer crime case of Philip Gonzalez Padriquez, a computer operator charged with illegally accessing U.S. Department of Agriculture computers in Colorado, according to a source. In February, a federal grand jury in Denver issued an indictment containing three charges and four misdemeanor charges (CW, Feb. 11). A trial is scheduled to begin May 13 if the plea bargain falls through, the source said.

DEBs in the U.S. and Europe have gotten a good look at DEC's Microvax II, which could be unveiled next week. According to France's Matra Datavision, the product line will consist of five models, based on Cmos technology, with memory that can be upgraded from 512K bytes to 1.2M bytes. The upward limit of the Microvax II is 1.5M bytes. Low-end models in the line are expected to be available in June.

Management Science America, Inc. (MSA) is expected this month to announce a series of distributed personal computer applications, according to a company source. The micro applications will reportedly allow reference data bases to be downloaded via MSA's Expert Link to IBM Personal Computers for processing, including transaction validations and edits. The products will help relieve the host and lower communications costs because communication with the host is not required while the micro is processing. Prices will reportedly range from \$1,000 to \$4,000 per application, with site licensing available for companies with 100 micros or more.

Hewlett-Packard Co.'s multi-billion-dollar Spectrum product family will make its long-awaited debut before year's end, according to Douglas Chance, vice-president and general manager of HP's Information Systems Group. Chance claimed that, contrary to recent reports, development work on the successor to the HP 3000 line is proceeding according to schedule. Chance said that about 40 Spectrum systems are up and running in various test sites.

Apple to drop faltering Lisa

By Kathleen Sullivan
CW West Coast Bureau

CUPERTINO, Calif. — Apple Computer, Inc. last week said it will halt production this summer of the Lisa personal computer, a system that gained recognition for its user interface design but floundered in the marketplace.

In the same announcement, Apple said it will introduce an external 20M-byte hard disk drive for its 512K-byte Macintosh computer this fall.

Subsequently, the company told securities analysts that it is considering further cost-cutting measures in light of slow demand for personal computer products. Commenting on Apple's recent performance, Chairman Steven Jobs last week said, "April has not been one of our better months."

Lisa users who were contacted were not dismayed about Apple's announcement. Joel Elde, microcomputer specialist with Winnebago Industries, Inc. said that for reasons he would not detail, the Forest City, Iowa, recreational vehicle maker was already planning to emphasize the use of IBM Personal Computers and compatibles, rather than the 21 Lises it already has installed.

Asked if he would buy more Lises at closeout sale prices, Elde said, "We have saturated our need for more Lises."

In response to Apple's announcement, a user in the corporate data processing department of a major Los Angeles manufacturer said, "Apple took [the time in terms of converting the Lisa] to [Macintosh], and frankly, I don't know what... we're going to do with it."

Introduced two years ago, the Lisa represented Apple's first venture into the corporate personal computer market.

Although the microcomputer was applauded for its use of icons, graphics and a mouse pointing device, analysts warned that its \$10,000 price tag was too high.

Since its introduction, the Lisa's price has plummeted. The most recent price cut was announced at Apple's annual meeting in January, when the company launched its Macintosh Office. At that time, Apple renamed the Lisa, dubbing it the Macintosh XL, and cut its price to \$3,995.

Only four months ago, Apple was describing the Macintosh XL — with its 1M byte of internal storage and 10M-byte internal hard disk drive — as the high-end system in its Macintosh Office. But its tenure in that office was short-lived.

Barbara Krause, a company spokeswoman, said Apple will continue to service and support the machine. This spring, Apple will begin shipping a number of products designed to enhance the system, including a kit to change the Lisa's screen resolution so that it corresponds to a Macintosh screen and software that will allow users to convert Lisa data files to Macintosh files, she said.

Tim Bajarin, an analyst with Creative Strategies International, a San Jose, Calif.-based market research firm, applauded the company's move. He said Apple's decision to suspend production of the Lisa would allow the firm to fine-tune its concept of the Macintosh Office.

Chris Steitz, an analyst with Infocorp, a Cupertino, Calif.-based market research firm, estimated that Apple had sold only 60,000 Lisa personal computers in two years. Although the machines began moving faster in recent months, it was probably a case of "too little, too late," Steitz said.

Analysts noted that the departure of the Lisa would leave a void at the high end of the Macintosh line, even with the introduction of the 20M-byte hard disk drive. They said Apple would fill that gap with future Macintosh announcements.

Krause said she did not know whether the decision would result in layoffs at Apple's Dallas plant, where workers assemble the Lisa, as well as the Apple IIc and Apple IIe. She said the company would try to absorb the workers affected by the announcement into its other operations.

CW senior writer Ed Turner contributed to this article.

NEWS SUMMARY

Phillips Petroleum has made an almost total conversion from IBM's 3420 10½-in. reel-to-reel tape drives to 3480 cartridge tape units/3

DEC unveiled an enhanced PDP-11/84 machine said to perform 20% to 40% better than the original OEM version/4

Two major large-systems software vendors unveiled products during a busy week of microcomputer-to-host link announcements/4

Unemployed Hoffmann-La Roche MIS workers are looking to enter the world of IBM/5

Some placement professionals are pessimistic about finding jobs for out-of-work Honeywell users/6

Xerox rolled out a fleet of products last week, including personal computers and laser printers/12

Compaq launched IBM Personal Computer AT-compatible products and set prices on all existing models except the single floppy disk drive Portable Personal Computer and Desktop Model 1/13

ADR offered IBM IMS and OL/1 users another path to relational DBMS technology with the introduction of automated migration software/14

The FCC allowed AT&T's restructuring of private-line rates to go into effect, subject to further investigation and monitoring/15

Comdex/Spring '85 opens its doors in Atlanta, expecting to draw 50,000 attendees/16

James Martin, information systems guru, sees a future of improved software productivity following a change in DP methodology/17

Xerox executive recently challenged the belief that large doses of computing resources and technology spending result in high levels of management productivity/18

Conference Board panel members struggle to define the best way to unleash microcomputers in their organizations/19

NCR announces a competitor for the IBM Personal Computer AT/22

A Bank of Boston vice-president said a company's computer resources must be tied to its business planning/24

Executives directing end-user computing at large corporations claim their jobs vary according to the corporate culture/26

A system that helps manage manufacturing operations has reaped a \$1.5 million savings for a company in Oklahoma/29

UPDATE
Toward the fifth generation/Follows 55

IN ENQUIRY
New partners in information/Follows Update/24
Understanding the DP professional/10/7
Microprocessors/10/25
Prototyping/10/23

International Report/28
Tomorrow's Time/22
Calendar/33

SOFTWARE/34
SOFTWARE & SERVICES/41
SERVICES/41
SYSTEMS & PERIPHERALS/75
COMPUTER INDUSTRY/85

SUSPENSE

**How did IBM's
rookie sort (Rel 7.0)
do in its first
meeting with
"Lefty" SyncSort?
Read all about it!**

or Call (201) 568-9700.

**Get the inside
scouting report.**

It is one of those historic moments in the Annals of Sort! The very first appearance in competition of IBM's new DFSORT, Release 7, in the tough-as-nails MVS/XA League. Will the kid be able to live up to his advance press notices?

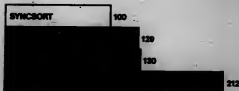
Confidently DFSORT7 strides to the plate... knocks the dirt out of his spikes... hitches up his britches... raises his sort assists.

Then, as sorting fans everywhere gasp in amazement, he lifts his arm lazily and points toward the centerfield flagpole, thousands of bytes away. The kid is going to try to emulate Babe's mighty homerun shot!

Moments later, SyncSort winds up... a curving white blur is seen... and... and...

There is no joy in Armonk! DFSORT7 struck out every time it came to bat against the latest release of SyncSort (Release 2.5E) in a recent series of MVS benchmark tests. (In sorting, as in most other forms of human endeavor, it's a long way from baby to Babe.)

The bar charts below tell the story more eloquently than we can:



DFSORT, Release 7.0

That didn't surprise us too much. After all IBM isn't known for its sorts...and we're not known for our computers.

We stick to what we do best. Maybe some day they will too. But in the meantime, you're faced with a choice of sorts. You can use their sort, which gets the job done (eventually). Or you can use our sort. We're a little faster. (We're also very modest.)

syncsort
INC.

Syncsort Incorporated 560 Sylvan Ave., Englewood Cliffs, N.J. 07632

NEWS

Ex-Honeywell site staff aims at IBM world

By Charles Bobrowich
CIV New York Bureau

EDISON, N.J. — After two hours of IBM CICS formatting instruction, the roomful of students — all experienced Honeywell, Inc. users — were still paying rapt attention.

CICS does not run on Honeywell computers, and most members of the class had yet to spend a day with an IBM mainframe, but they recognized the value of the training. It was a lifetime cost to them after they were dismissed from their jobs at Hoffmann-La Roche, Inc., a N.J. pharmaceutical company. Hoffmann-La Roche is a Honeywell

shop, and its former employees have found themselves suddenly adrift in a predominantly IBM world, chess members said.

On Feb. 4, Hoffmann-La Roche cut its staff by 1,500 — after its patent expired on Valium and Librium, drugs that at one time were the No. 1 and No. 2 best-sellers in the U.S. With nothing to replace them, the firm decided it needed to cut costs by \$50 million, company officials said.

The cuts were made across the board, a Hoffmann-La Roche spokesman said, although the former employees

See CWTB page 8

Basic skills transferable, headhunters say

PARANUS, N.J. — Placement professionals said Honeywell, Inc. skills can be transferred to an IBM environment, provided the skilled person can find someone to hire him.

It would take "no more than two to three months" for someone trained on Honeywell systems to learn a new environment, said Norman J. McLaughlin, DP placement manager at Robert Half of Boston, Inc.

For that matter, there are many openings for Honeywell-experienced people in the Boston area, McLaughlin said.

But other placement experts were less optimistic that the MIS staff members caught in a cutback at Hoffmann-La Roche, Inc. in New Jersey would be able to find a job.

It is not difficult to transfer skills from one system to another, said Robert W. Shields of Robert Shields & Associates of Houston, but there are few jobs to choose from among the non-IBM vendors.

"If you have 100 programmer jobs

open, 85 to 90 will be IBM," he said. Finding jobs for people with experience on Control Data Corp., Honeywell or Sperry Corp. machines is easier than for those with experience from other vendors because their equipment often correlates with IBM's. When it comes to Burroughs Corp. or NCR Corp., however, "forget it," Shields said.

The best approach for the former Hoffmann-La Roche employees is to seek jobs in combined Honeywell-IBM shops where their Honeywell experience will be valued and they will get a chance to learn IBM. There are very few such jobs in the Houston area, he said.

A third placement official said the real issue may not be Honeywell vs. IBM experience. It may be the age and salary level of the former Hoffmann-La Roche employees.

"I'm familiar with the Hoffmann-La Roche situation. They are good, solid people but not great," said Robert D. Halbrecht of Halbrecht Associates, Inc. of Stamford, Conn.

The Hoffmann-La Roche systems programmers and program analysts were well-paid individuals who are going to have a tough time convincing an employer to both hire and train them at their present salary level, Halbrecht said.

"When the market gets a little soft, companies look for the best people — the stars," but when they look at middle-aged people, they ask whether they haven't already peaked, he said. "It's not a good time to be 45 or 50 and not have made it pretty big," he added.

At a class for the former Hoffmann-La Roche MIS workers, Edward G. Weiss noted that one of the dismissed employees was 56. "What's he going to do?" he asked.

Weiss, 62, one of the few terminated workers to find a job, said he did so by taking "a cut in status and pay" and by looking for a job before the cuts were announced.

— Charles Bobrowich

DORBANDT

(See page 1)

senior group manager in systems development in charge of the information center he was one of the highest level computer managers let go.

Being out of a job "was a shock," even though Dorbandt, unlike many of his coworkers, had told himself it might happen. Hoffmann-La Roche had warned six months earlier that cuts were coming, without indicating who would be affected.

When he was let go, Dorbandt found he had prepared himself better than he had prepared his wife and two teenage daughters. One of his key strategies — for them as well as for himself — was to continue his daily routine. Each morning since Feb. 4 he has left for work, although now "my job is looking for a job."

"In retrospect, it's a new lease on life," he said.

"Hoffmann-La Roche is no longer a growing company. There simply isn't the opportunity there anymore," said Dorbandt, who is looking for a director-level job in a strong company. "I've played all the instruments. It's time to lead the orchestra."

Dorbandt started out with Hoffmann-La Roche as a systems programmer. As a group manager, he directed much of its third-generation software development in finance, marketing, research and engineering, he said.

At a time when Digital Equipment Corp. had produced only a handful of its VAX minicomputers, Dorbandt decided they would be "a fundamental research engine" and committed Hoffmann-La Roche's research arm to using them, he recounted.

Dorbandt said it was "a natural migration" from minicomputers to microcomputers and became the director of the information center, supervising six people and training 700 employees to use IBM Personal Computers.

Not all of this experience is instantly marketable, however, since Hoffmann-La Roche uses Honeywell, Inc. mainframes, and there are few other Honeywell sites in the metropolitan New York area.

"It's an IBM-oriented marketplace, and I am directing my efforts with that in mind. One of my long-term objectives has been to get into the IBM mainstream," he said. Still, he said he is "looking for opportunity rather than a particular piece of iron."

Skills transferable

Unlike many former Hoffmann-La Roche programmers and systems analysts, Dorbandt said he believes his skills as a manager "transcend technical details and are transferable" to non-Honeywell sites.

Even those with skills that are primarily technical should not worry about eventually finding another job, he said.

As for his own search, Dorbandt has the services of a placement agency, secretaries and counseling, paid for by Hoffmann-La Roche, and he consults the want ads of trade magazines and newspapers.

But he said the real search probably is going on through business associations with whom he has been in contact.

"For a lot of people, this is going to be a real mid-life kicker. It is going to give them the chance to renew their skills and their confidence in themselves," he said.



FDR/COMPAKTOR/ABR Innovation Data Processing, Incorporated

MANAGEMENT SUMMARY

FDR (formerly known as Fast Dump Restorer) is a dump and restore utility designed to reduce the time required to perform a dump and restore the data. FDR replaces all standard IBM dump/restores utility, supports all VSI and MVS(XA) environments, and can be used with most IBM and compatible disk devices.

FDR uses three method phases in obtaining input/output efficiency: 1) the use of incremental blocking factors, 2) the elimination of redundant and unnecessary data, and 3) the use of cylinder orientation to minimize delays due to physical rotation, arm movement, and so on. FDR also offers a performance option (BUPNO=MAX) that increases the number of input FDR units during the dump operation, and is designed to decrease elapsed time and save system resources. FDR has a full-volume disk-to-disk feature.

FDR includes a Stand-Alone Restorer (SAR) program. This program allows restoration of a full-disk volume when, due to the unavailability of a VSI or MVS operating system, FDR cannot be run. SAR can also be used to restore partial volumes and to clip a volume. SAR also aids the operator by issuing prompting messages on the console and error messages on the console, printer or tape whenever a problem is encountered during the restore. SAR also permits the Restorer of specific tracks.

Recent enhancements to SAR include support of stand-alone operations in MVS/XA mode, a stand-alone backup capability, and support of backup and restore functions under VME.

A no-charge option available to FDR users is the Data Set Functions (DSF) subprogram. DSF allows the user to dump and restore individual data sets on a pack and to dump and restore by absolute track. It can also be used to restore data sets from full-volume FDR backup tapes and allows the user to resume a data set when restoring it. Password protection is provided, and can be activated on either a volume or data set basis.

CompaKtor (CPK), an extra-cost option, is a disk management utility used to reorganize direct-access volumes using the FDR methodology. It reduces space fragmentation, merges data set extents, aids in positioning data sets, and offers several other solutions to frequent disk pack organization problems.

Automatic Backup and Recovery (ABR) is another extra-cost option that manages disk space on direct-access volumes. Disk volumes and data set backup can be automated based on the last reference date and update characteristics. Data sets that have not been used for a time period can be automatically archived, freeing the disk space for more productive use. Reports can be tailored to user specifications. A Data Not Found Exit permits the

Automatic Restorer of data sets that have been archived without user intervention. The vendor recently released extensive ABR panels for TSO users. This panel provides complete dataset and volume reporting, data positioning and users more direct control over their datasets. ABR is designed to operate with both the DSF and CompaKtor subprograms.

FDR provides enhanced support for VSAM files which are cataloged into an ICF catalog. These data sets are also recoverable with DSF and ABR.

COMPETITIVE POSITION

While the packages listed on page 6 of this report compete with the FDR/CompaKtor/ABR products, the only competition for FDR itself is IBM's DF/DSF. FDR is more efficient than the IBM product. This, along with its reliability, account for FDR's very extensive user base.

The other products listed as competition are disk space management packages and thus compete with ABR. The main competition includes Cambridge's ASMA2 and Sterling's DMS/OS. While both of these products were introduced several years before ABR, neither has as large a user base. In addition, they are both more expensive than ABR.

The FDR/CompaKtor/ABR family of products holds a very strong market position that is likely to continue. The family provides outstanding performance and reliability, and the vendor has earned a reputation for quality control that is equaled by few in the industry.

ADVANTAGES AND RESTRICTIONS

FDR, as its name implies, is a fast method for dumping and restoring data. The package is faster and more efficient than similar IBM utilities, and achieves a high performance level, reducing elapsed time and saving system resources.

A major advantage is the Stand-Alone Restorer program. The ability to backup and restore disk volumes without an available operating system is critical to disaster recovery. The automatic restore to utility devices and the automatic restore of archived files are additional advantages.

Another major advantage is the outstanding reliability of both the product and the vendor, as attested to by the rating in Table 1 and the wealth of comments from users. Many consider FDR the most reliable software package they have ever used, with never a bug to be found. Another decided advantage of FDR is the free 90-day trial offering.

USER REACTION

Twenty-three users of FDR responded to an independent Datapoint survey. The average age of installation was 4½ years. The utility was running on various IBM mainframes as well as on an Amihid 5660 and three NAS models. All but one was running under MVS, MVS/SP, or MVS/XA.

Not every respondent rated all categories. Six did not rate user education, explaining that none is available.

TABLE 1

	Best	Good	Fair	Poor	MAIR*	CR**
Reliability	23	0	0	0	4.89	-1
Efficiency	19	4	0	0	3.83	1
Range of installation	20	3	0	0	3.87	1
Range of use	12	10	1	0	3.48	1
Transferability	19	3	0	0	3.88	1
Documentation	10	9	3	1	3.22	1
User education	5	4	6	2	2.71	2
Vendor's maintenance	14	7	6	0	3.67	1
Overall satisfaction	17	5	0	0	3.77	1

*Mean Average User Rating, on a scale of 4.0 for Excellent.

**Center Analysis—the range of groups user ratings assigned to each factor for each category, where Center 1 is the highest and Center 5 is the lowest. (See Report FDR-500-40 for individual category Center statistics.)

These users overwhelmingly stressed the advantages of FDR. All 23 said the package performed as promised by the vendor. Many comments were made regarding the outstanding reliability of the package, with long-time users saying that they have never had any problem with FDR. They consider FDR the most reliable software from they have ever dealt with, with one commenting: "I wish some of the big name software firms took some lessons in quality assurance from Innovation." This is also reflected in the table above, with reliability receiving a very rare 4.00 rating.

Twenty users said FDR saved system resources, 18 said it saved staff time, 12 considered it inexpensive, and 16 said that using FDR resulted in financial savings for their companies. Fourteen considered the package simple to operate and 10 said it is flexible in its capabilities, allowing different device migration, archiving, single dataset restore, and global functionality.

Several users praised the vendor for providing excellent technical support. IDP is very responsive to problems or questions and the support staff is very well trained with thorough knowledge of the intricacies of FDR and MVS. In addition, IDP is quick to upgrade their product as users as IBM announces any new hardware or system modifications. Furthermore, the vendor is continually improving and enhancing their products' capabilities.

Few restrictions were mentioned. Two users considered FDR complex and one said it is inflexible, while another said that the migration facility for data set movement to utility devices is slow. One user said the documentation is poorly organized, while the user who rated documentation poor commented that there is no overall description of how all the components of the package fit together. As a result of this, much time is spent flipping through the manual to determine what is needed to carry out a requested function. A vendor spokesman explained that organization of the documentation is difficult because some users have only one component of the product. While there are no major plans for changing the documentation, the vendor is currently adding more examples of how to use the product. □

NEWS

BYPASS from page 1

now," noted Seth Lewis, manager of telecommunications with Home Insurance Co., a property and casualty insurance firm headquartered in New York. To justify such a system, it "used to have to offer something else besides potential cost savings, such as improved speed, response time, performance or quality."

Three-quay money

Obviously, the shorter the payback and the longer the system can be used, the better. With bypass, however, the up-front costs might be throw-away money, according to William E. Kane, director of telecommunications for SEI Corp., a Wayne, Pa., company that provides computer services for investment firms.

"I can spend \$60,000 [on a bypass system] now and find out in 18 months that the company I did business with has been purchased or has run out of funds or that the technology and my internal needs have changed far enough that I can't use it anymore," Kane said. "If I can use the system for five years—which is a long time in this industry—then it becomes reasonably easy to justify. But if you're on the borderline between two or three years, it's hard to make an economic justification for it."

Others agree. "If you can't justify the fact that the bypass system is going to be a good technology two to three years from now, how are you going to justify it in five years?" said Dohn Kivett, vice-president of

telecommunications with Wachovia Corp., a bank with 200 offices in North Carolina. "You're going to have to live with that system for a while once you install it."

Advantages questioned

Kivett does not know if there are any great advantages to be gained at this point by implementing a bypass system. Wachovia's network consists of roughly 400 leased lines within North Carolina, where "services are reasonably priced and service and response has been good," Kivett said. "If local mileage rates continue to increase, that might make bypass more attractive."

Bypass attractiveness varies by state, given variations in rates, applications (voice/data, local or long distance), acceptable level of service (availability, reliability and error rates), availability of alternatives and by the technologies for implementing such systems.

SEI and Home Insurance, for example, have each considered turning out their local loops in favor of direct links to AT&T Communications central offices.

Home Insurance operates a network of roughly 150 multistep analog leased lines that tie its New York offices with remote branch offices and agents. "The most effective type of bypass for us would be to get some kind of TI links... directly to AT&T to take out the local loops," Lewis said. "But we couldn't justify all the new hardware we would need" to terminate the high-speed digital facilities, he added.

Home Insurance ruled out the use of a microwave link to AT&T because "the network is critical for us and we couldn't take the chance of any increased downtime that we would potentially be exposed to with a microwave shot in downtown New York," Lewis said.

Local loop alternatives

SEI is also considering bypassing the local loop by installing multiple TI spans between its facilities and the AT&T switching offices that terminate its network of 500 to 600 leased lines. AT&T has done a preliminary study of SEI's facilities, and Kane is waiting for the results. "If it's anywhere close to economical, it would be beneficial for me to get rid of those local loops." This would eliminate finger pointing between the local and long-distance carriers when circuit problems arise, Kane said.

If SEI implements the TI links, its local telephone company would not totally lose out. Under some conditions that install private facilities directly to long-haul carriers [CW, April 15], AT&T would probably com-

pete with SEI's local telephone company to provide the circuit. Typically, however, the price of 18 leased lines is the same as that of a TI link that provides 24 leased-line equivalents, meaning the local company would lose some revenue.

The options available for local bypass—beyond long-distance carriers, private microwave, infrared or point-to-point cable between buildings—are not feasible for long-distance bypass. The only viable way to get around long-haul common carriers today is to install private satellite networks.

You have to worry about the inherent delays with satellites, Syracuse warned. "If you add just a second of holding time on each call, then you can start blocking other calls," he maintained.

Users who do not have the concentration of traffic needed to justify bypass may still be able to capitalize on the technology. "Our initial judgment is that bypass is not meant for users of the geographical structure," said Kerry Overman, corporate telecommunications and QA director with United Fruit Co. in Boston.

BANKS from page 1

chines, the banks improved customer service and found customers making smaller and more frequent transactions with no net gain for the bank. If fewer tellers were employed, more high-cost computer specialists took their place, said Phillip Strauss, a senior consultant.

CUTS from page 6

claim any department not tied to operating revenue suffered heavily, including MIS systems development.

"None of these people were terminated for performance reasons. They were all absolutely proficient in Honeywell systems," said Frank Falconieri, an official at Passaic County College in New Jersey who helped set up the CICS course.

Nevertheless, the former Hoffmann-LaRoche employees said they are finding their experience of little value in looking for a job; sometimes it is even a hindrance.

"Honeywell has great, modern facilities, but they don't have too many users around here," said Theodora H. Osgingdon, 45, a Butherford, N.J., programmer analyst. Because she arrived to work early Feb. 4, she was the first MIS person dismissed, she said.

There are a lot of large organizations that need management support—and they're not Honeywell [nites], said Thomas M. Downie, 44, of Park Ridge, N.J., who spent 10 years in management support services at Hoffmann-LaRoche.

"I want to get into the IBM environment. Seventy percent of the world is IBM, and it behooves us to recognize it," said Frederick M. Hendricks, a former staff manager in systems development with 25 years experience at Hoffmann-LaRoche.

The Edison class in CICS was set up to help the former Hoffmann-LaRoche employees transfer their Honeywell knowledge into a common IBM environment. It is being financed by the Private Industry Councils of several counties and Passaic College.

Some class members, however, wondered if training in CICS would

In effect, the banking executives surveyed have allowed themselves to be driven by the new technology, incorporating it into their operations but not planning increased returns from its use.

"Computers have made banking more efficient, but banks haven't been able to get people to pay for it," Strauss said.

be enough.

"I don't even mention Honeywell. It's considered practically obsolete at many companies," said Celia A. Hines, of Morris Plains, N.J., who rose from programmer to a manager in the information center during 11 years at Hoffmann-LaRoche. Still, she said, Honeywell is there on her resume and prospective employers lose interest during interviews when they spot it, she said.

Osgingdon said she answered an ad for someone to be trained as a programmer analyst in IBM systems, only to be told the company wanted to train someone who already had IBM programming experience.

"The software is changing so fast. Sometimes the old experience isn't too good for you," said Spencer S. Chapp, 40, of Parsippany, N.J., a program analyst.

"All of the IBM manuals are written in IBM acronyms. They're so different" from Honeywell terminology, noted A. Louise Zamboni, a computer security specialist who said he was never buster than during the last few weeks of his job.

Despite the obstacles, many former Hoffmann-LaRoche employees said the Cobol skills they developed carry over to IBM environments after the employee learns IBM terms.

Downie, who had experience on IBM systems before joining Hoffmann-LaRoche, said he felt he could be productive within a few weeks after joining a firm.

One of the former Hoffmann-LaRoche employees said he lost out on a job at another Honeywell shop and it is just as well. "If I had gotten it, I would just be back in the pickle," said Edward G. Wolfe, one of the few people who has found work since the cuts.



SATISFIED SENIOR VPS ARE GOOD FOR YOUR SYSTEM.

SDI Support Systems can help you show your management new ways to produce high quality documentation, user support materials and training aids with speed and economy.

From mainframe to micro, for data processing hardware or software, SDI is good for your system.

For more information, call Jack Tuttleboe, at 201-592-8745, or write: SDI, 222 Bridge Plaza South, Fort Lee, NJ 07024.

SDI SUPPORT SYSTEMS

DOCUMENTATION • INSTRUCTIONS • TRAINING AIDS • SALES SUPPORT



*"About that data base conversion, sir.
The department doesn't seem to share our enthusiasm."*

ADR ANNOUNCES THE AUTOMATION OF THE AWESOME CONVERSION PROCESS.



**INTRODUCING
THE ADR/DL1
TRANSPARENCY.™**

**THE BRIDGE
OUT OF DL/1.**

Data base conversion. Just the thought is enough to send shudders through even the most seasoned data processing professional. It's been described by some as "trying to change a tire on a moving car." And the whole ordeal can take years to complete. So it's surprising anyone would attempt it.

But a growing company will have to convert eventually. Because DL/1, the old workhorse, just isn't capable of delivering all the sophisticated services a growing company needs.

And the dilemma is ignored by data base companies who simply try and sell you a new data base management system (DBMS) and let you worry about conversion.

That's why we invented Migration Software.

ADR MIGRATION SOFTWARE. MOVE AHEAD WITHOUT FALLING HOPELESSLY BEHIND.

The new ADR/DL1 TRANSPARENCY allows you to migrate from your old DL/1 or IMS/DB DBMS to our high performance relational DBMS, ADR/DATACOM/DB.* And your existing applications will run exactly as they did before. Without modification.

And the ADR/DL1 TRANSPARENCY designs your new data base and reformats your existing data. Automatically. So a conversion with the ADR/DL1 TRANSPARENCY is quick, cost efficient and virtually error free.

ADR TEACHES YOUR OLD DATA NEW TRICKS.

The ADR/DL1 TRANSPARENCY lets programmers make new uses of

your old data with powerful productivity tools like ADR/IDEAL; our 4th generation application development system.

And end-users can make strategic uses of the company data with relational query languages like ADR/DATAQUERY* and decision support systems like ADR/EMPIRE.* And with ADR/PC DATACOM,* they can even access mainframe data with their own personal computers.

ADR WRITES THE NEXT CHAPTER IN THE HISTORY OF SOFTWARE.

With the ADR/DL1 TRANSPARENCY, ADR begins a new era—software that allows your system to evolve with new technology.

So, if you've been using DL/1 or IMS/DB and have been waiting to take advantage of the new relational technology, but were concerned with the overwhelming problems of replacing all your old data and applications, mail us the coupon. Or call 1-800-ADR-WARE.

Because, while other software companies are talking about the tools you need for tomorrow, ADR is letting you use them today.

ADR WE KEEP WRITING THE HISTORY OF SOFTWARE

Applied Data Research*	
Orchard Road & Rt. 206, CN-8,	
Princeton, NJ 08540. Or call	
1-800-ADR-WARE. In NJ, 1-201-874-9000.	
<input type="checkbox"/>	Please send me more information about the ADR/DL1 TRANSPARENCY.*
<input type="checkbox"/>	Please send me information about ADR Integrated Software.
<input type="checkbox"/>	Please send me information about ADR Seminars.
Name _____	Position _____
Company _____	
Address _____	
City _____	State _____ Zip _____
Phone Number _____	
Computer Equipment _____	

DL/1 and IMS/DB are trademarks of the International Business Machines Corp. © 1988 ADR

NEWS

Xerox unveils micros, software, laser printers for office

By Richard Warner
CW Staff

NEW YORK — A fleet of products targeted at the office work group — including five personal computers, a software series and two laser printers — was unveiled here by Xerox Corp. last week.

The personal computers all are said to offer IBM Personal Computer compatibility and run the Microsoft Corp. MS-DOS operating system. Four of the five are manufactured by Ing. C. Olivetti & Co., the Italian firm that builds the AT&T 6300 personal computer. The fifth, priced at \$4,995, reportedly offers 1.1M bytes of memory and the windowing and mouse-driven features normally associated

with much higher priced Xerox Star systems.

Like the AT&T 6300, the four Olivetti machines use an Intel Corp. 8086 family microprocessor. Two of the four, the 6064 and 6065, reportedly include a keyboard, monitor and 384K bytes of memory. The 6064 includes twin diskette drives and is priced at \$2,595. The 6065 offers a single diskette drive and an internal 10M-byte hard disk and is priced at \$4,495. Both will be available in the U.S. within the next three months.

The other 8086-based machines, the 6067 and the 6068, reportedly feature greater memory, bundled Xerox word processing software and specially designed word processing

keyboards. The 6067 is offered with Xerox Writer I software and includes twin diskette drives, 384K bytes of memory, a 640- by 600-pixel display and a price of \$2,595.

The Xerox 6068, meanwhile, offers the same display, 512K bytes of memory, a 10M-byte hard disk and Writer II, a more sophisticated word processing package. The 6068 is priced at \$6,150. Both machines will be available in the third quarter.

The fifth machine in the rollout, the Xerox 6086, debuted along with a software series for it that includes a windowed environment and mouse-driven functions. With a built-in 10M-byte drive, 15-in. display and 1.1M bytes of internal memory, the

6086 carries a standard version price tag of \$4,995. Included in the 6086, available in September, are a keyboard, mouse and two RS-232C ports. Included with the 6086 was Viewpoint series software, including a \$125 Viewpoint windowing environment. Viewpoint reportedly contains the Xerox Pilot operating system and serves as the cornerstone for use with the other packages in the Viewpoint series. The packages will be priced from \$35 to \$495. The entire Viewpoint series will be available in September, a Xerox spokesman said.

Two laser printers, a high-end and a low-end model, were also unveiled.

The high-end Xerox 8700 reportedly prints at up to 34 page/min and includes a 10M-byte hard disk that can store up to 2,000 pages and receive print jobs from a host computer. The 8700 features RS-232C and Contronics Data Corp.-type parallel interfaces. It is priced at \$29,995 and, with Xerox controllers, can support IBM communications protocols including Systems Network Architecture/Synchronous Data Link Control.

At the low end, the \$4,995 Xerox 4046 Laser CP claims a 10 page/min printing rate and the ability to store up to 128 different type fonts. Included are both parallel and RS-232C interfaces, along with 128K bytes of memory, expandable to 384K bytes. The Laser CP can print documents created on a micro using software designed for printing on a Xerox 2700 II electronic printer or a Xerox Diablo 650 daisywheel printer. Xerox said the Laser CP will be available in the third quarter in some U.S. cities.

Xerox is located at Xerox Square 006, Rochester, N.Y. 14644.

CPT introduces real office automation.

productivity



Real office automation is friendly. Productive. It's a good neighbor; working with your existing systems, not against them. It's as compatible with human beings as it is with personal computers and mainframes.

It's by your side when you can't remember what you sent, how you filed it or who you sent it to. Real office automation retrieves every reference in the entire office... in seconds... guided only by a word or a phrase.

Electronic mail, calendaring, scheduling and other tasks are almost effortless because its technology is startlingly advanced. But we don't dwell on that. Technology is not as important as how easily and effectively you can use it.

Real office automation is available now from CPT... for large or small offices. Call 1-800-447-4700 for a free booklet and a friendly introduction.

CPT.

1-800-447-4700

Microsoft rolls out spreadsheet

BELLEVUE, Wash. — Microsoft Corp. last week introduced a spreadsheet for the Apple Computer, Inc. 512K-byte Macintosh micro that reportedly incorporates business graphics and a data base.

Called Microsoft Excel, the spreadsheet reportedly offers 16,384 rows by 256 columns — over four million cells — and two-way file compatibility with Lotus Development Corp.'s 1-2-3. Users may also create macro programs using a built-in recorder that creates the macro while the user carries out applications.

The Excel spreadsheet, which costs \$295, reportedly will come bundled with Apple Switcher, a program developed by Apple that allows users to switch between Macintosh applications. Apple Switcher, not yet formally announced by Apple, will permit users to have both Excel and Microsoft's Word in memory and to switch and exchange data.

Excel will be available in September. Current owners of Microsoft's Multiplan for the Macintosh can upgrade to Excel for \$200. Owners of both Multiplan and Microsoft's Chart for the Macintosh can upgrade for \$100. Microsoft can be reached through Box 97300, 10700 Northrup Way, Bellevue, Wash. 98009.

NEWS

Compaq launches IBM AT-compatible family

HOUSTON — Compaq Computer Corp., the largest supplier of IBM Personal Computer-compatible computers, launched its long-awaited line of Personal Computer AT-compatible systems and cut prices on existing models last week at its annual meeting.

The systems run up to 30% faster than the IBM Personal Computer AT and offer a range of options, the firm said. Both portable and desktop versions carry a starting price of \$4,490 and are available immediately.

Compaq claimed that the Compaq Portable 286 features IBM AT compatibility, an optional 800K-byte hard disk drive, an optional internal tape backup system and the ability to handle up to 2.8M bytes of random-access memory (RAM). Exactly the size of the original Compaq Portable Personal Computer, the machine weighs 30 pounds.

Like the Portable 286, the Compaq Deskpro 286 is based on an Intel Corp. 80286 chip running at either 6 MHz or 8 MHz. The system reportedly offers up to 8.2M bytes of RAM, 70M bytes of hard-disk storage and space for four internal storage devices.

Analysts react favorably

Industry analysts and dealers generally gave the introductions high marks. By offering a compatible system with unique enhancements, Compaq is "replicating its success with the [IBM Personal Computer] and the XT," said Chris Ruetz, senior analyst at Infocore, who predicted that 35,000 of the new systems will be sold this year.

"This lets them keep up with their game of follow the leader," said Michael Gernan, vice-president for research at E. F. Hutton & Co. "They're got momentum."

Like others, however, Gernan said the window of opportunity created by slow AT deliveries is closing, and IBM's potential economies of scale threaten to crush compatible suppliers.

The high-end systems are said to work with popular software programs, hardware peripherals and add-ons for the AT.

The Compaq Portable 286 Model 1 features 256K bytes of RAM, a 1.2M-byte diskette drive, a 9-in. high-resolution text/graphics monitor, keyboard, parallel and serial ports, security lock and three expansion slots. It also has interfaces for red-green-blue, composite video or TV monitors. The Model 2, similar except for offering 640K bytes of RAM, a 20M-byte hard disk drive and two expansion slots, will sell for \$6,290.

Options include an \$800 10M-byte tape backup system, a \$1,095 512K-byte added memory board, a second 1.2M-byte diskette drive priced at \$650, a 360K-byte diskette drive that costs \$350, a \$2,095 20M-byte hard disk drive and MS-DOS 3.0 and Basic software for \$65.

The Compaq Deskpro 286 Model 1 includes 256K bytes of RAM, a 1.2M-byte diskette drive, five available expansion slots, space for four half-height internal storage devices, security lock, parallel and serial ports and monitor interface. The \$4,490 standard price includes an op-

tional \$256 12-in. text/graphics monitor. The Model 2 provides 640K bytes of RAM, a 20M-byte hard disk drive and four available expansion slots. It costs \$6,250 with monitor.

Last week Compaq also dropped prices on all existing models except the single floppy disk drive Portable Personal Computer and Deskpro Model 1, which analysts agreed was a logical repricing move.

The price of the standard portable with dual floppy disk drives was reduced to \$2,990 from \$3,295, and the cost of the Compaq Plus Portable Computer dropped to \$3,990 from \$4,995. Prices for Deskpro models (with monitors) dropped as follows: Model 2 to \$2,990 from \$3,995, Model 3 to \$4,490 from \$4,995, Model 4 to \$6,790 from \$7,195.

Compaq is located at 20565 FM140, Houston, Texas 77070.

IS YOUR COMPUTER STEALING YOU BLIND?

Computer related health problems rob productivity. But you can improve worker health by 87%, cut errors 42%, and increase productivity 10% with Dataspun Ergonomics Skills Training. CALL 1-800-645-6043 TODAY

Dataspun®
Ergonomics Skills Training

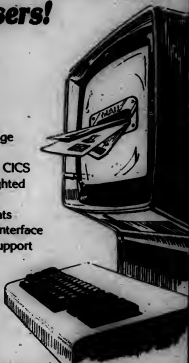
Dataspun is available through The Jones Institute - A Professional Training Corporation. Seattle, Washington, and in Associates throughout the U.S., Canada and Australia.

SYSM® - Electronic Mail for CICS users!

With New Features:

- Filing
- Calendaring
- Scheduling
- PC Document Exchange
- Electronic Forms
- DOS/VSE, VS1, MVS, CICS
- New Messages Highlighted
- Postdated Messages
- Transfer with Comments
- Application Program Interface
- CRT, Printer & TTY Support
- Ticker Files
- Over 300 Users

For more details
on SYSM® call:
(208) 377-0336



H&W™ H&W COMPUTER SYSTEMS INTERNATIONAL
P.O. BOX 4785 • BOISE, IDAHO 83711

NEWS

ADR cuts path to Datascom/DB from IBM's IMS, DL/1

By John Salsburg
CW Staff

NEW YORK — Applied Data Research, Inc. (ADR) gave IBM IMS and DL/1 users an automated pathway into the world of relational data base management system technology with the introduction last week of a system that migrates existing IMS/OL/1 applications to ADR's Datascom/DB without reprogramming.

ADR's DL1 Transparency reportedly allows IMS or DL/1 programs to operate against the Datascom/DB relational DBMS without changes to program logic. The system intercepts DL/1 or IMS requests and automatically translates them for processing by the relational DBMS.

An ADR spokesman said DL1 Transparency reduces the effort required to convert from the older IBM DBMS technology to a relational DBMS — an effort that involves rewriting program source code, recompiling programs and redesigning the data base. In addition, purchased applications software designed for IBM DBMS can be run against Datascom/DB through DL1 Transparency.

DL1 Transparency is said to provide a completely automated migration from an IMS or DL/1 envi-

ronment to Datascom/DB through the following four subsystems:

■ **Relational Data Base Design**, which creates definitions for Datascom/DB data bases from existing DL/1 definitions. It also automates the population of the ADR/Datascom/DB, which allows users to utilize ADR's ideal applications development system, Datascom query language and PC Datascom micro-mainframe link.

■ **Data Structures**, which reads all designated logical and physical IMS or DL/1 data bases and converts them, reportedly in a single pass, to Datascom/DB data bases.

■ **Intercept**, which, at program execution time, takes control of the IMS or DL/1 environment and determines which of the IBM DBMS calls are to be processed using Datascom/DB data bases. This subsystem also supports mixed-mode processing involving both IMS or DL/1 and Datascom/DB, allowing a phased transition of applications.

■ **Transparency**, which reportedly traps IMS or DL/1 calls from the applications and automatically generates appropriate Datascom/DB calls. Also, Datascom/DB return codes are translated to corresponding IMS or DL/1 codes and returned to the

applications. This subsystem of DL1 Transparency reportedly allows applications to run against Datascom/DB without modification. ADR President Martin Goetz said DL1 Transparency offers an alternative for users of IBM's older IMS or DL/1 technology who are not convinced of the capabilities of IBM's DB2.

Stephen Gerrard, vice-president and director of product marketing for ADR, said 65% of IBM mainframe sites with a DBMS use IMS/DB or DL/1 — a figure that translates to roughly 10,000 user sites. International Data Corp., a Framingham, Mass.-based market research firm, estimates the percentage slightly lower at just over 63%. Gerrard said DL1 Transparency is aimed at that audience.

DL1 Transparency was introduced to beta test in September and is now available to selected customers, according to ADR. General availability is slated for the third quarter.

DL1 Transparency runs under IBM's OS/VS1, MVS and MVS/XA in CICS/VS1, batch and shared mode. It costs \$40,000 for DB environments and \$50,000 for DB2.

ADR is located at CN-6, Rt. 206 and Orchard Road, Princeton, N.J. 08540.

DL1 Transparency seen appealing to narrow audience

By John Salsburg
CW Staff

Applied Data Research, Inc.'s (ADR) DL1 Transparency could prove to be an important new technology — provided users have tired of Big Blue's aging data base management systems, have decided to make the switch to a relational DBMS and are unhappy with IBM's DB2 strategy. But analysts and IBM DBMS users interviewed by Computerworld questioned whether those conditions exist today.

Introduced last week, DL1 Transparency allows IBM IMS and DL/1 users to run existing applications against ADR's Datascom/DB relation-

al DBMS without reprogramming. Users and analysts agreed that a manual conversion from a hierarchical to a relational DBMS would require a huge investment of time, money and manpower. Thus, they said, the product could be of value to users considering Datascom/DB for both production and information center requirements. Beyond that specific audience, however, DL1 Transparency may meet with only limited success.

"Anything that eases a conversion effort gets our attention," said G. E. Bachman, manager of computer services for Wichita, Kan.-based Beech Aircraft Corp. The firm runs more

than 20 applications under IMS on an IBM 3094 mainframe.

"But it would only be important if we were to switch to a relational system," he added. "We have not seen enough advantage in going to relational. We think IMS will hold up well for at least the next few years."

Bachman's sentiments were echoed by Bruce Johnson, manager of data base operations at Westinghouse Electric Corp.'s corporate data center in Pittsburgh. Westinghouse runs IMS under MVS/XA on an IBM 3081 processor.

"We are not interested in moving to a relational system, but we are following the progress of DB2," he said.

"If we move to relational we will be more inclined to consider IBM's product first."

Even users who have decided to go with relational do not necessarily see conversion as a problem. Carl Barley, manager for Torrance, Md.-based Bendix Corp., said his company is lessening its reliance on IMS and moving to Cullinet Software, Inc.'s IDMS, which offers relational capabilities. But a major barrier to reprogramming of applications, Barley said, is replacing older, IMS-based systems with newly purchased, DBMS-compatible packages.

Westinghouse's Johnson said IBM's current dual-DBMS strategy, which emphasizes the use of IMS for production systems and DB2 for information center needs, has not caused any concern. At the introduction of DL1 Transparency, ADR officials estimated that users were unhappy with the prospect of maintaining and paying for two DBMS — a charge other observers have also leveled against IBM. But, Johnson said, "IBM's strategy makes sense to us."

Steven Pfrendinger, president of Escondido, Calif.-based IMS Consulting, Inc., agreed. "There are some frustrated DL/1 users who will see ADR's announcement as a real opportunity. But I think most customers see fewer reasons to leave the IBM fold in light of what is happening with DB2."

According to Pfrendinger, early users of DB2 are enthused about its capabilities, and IBM is actively addressing problems that have cropped up in DB2 thus far. "Users are concerned about the two-DBMS strategy, but both they and IBM are also looking to DB2 to handle everything in the near future," he said. That ADR's timing may have been off was also the opinion of William Imms, a director at Coopers & Lybrand in Denver. "Three years ago, the market for this type of product was ripe," he said. "But the people who would have gone to Datascom/DB are now being shepherded to DB2. IMS users have been told by IBM that DB2 is the way to go."

You can learn a lot about your I/O subsystem by listening to Roger Kovach. The people who've heard his previous presentations around the world at CMG and Institute for Information Management courses have learned a lot about them. Now, in a series of concise, one-day seminars, he'll address several topics including disk drive performance and the effects of DASD configuration, shared DASD, and cache controllers on I/O performance.

The Last Time
Roger Kovach
Told People About
DASD Management
And Tuning
Techniques, It Would
Have Cost You \$400
To Hear Him.
Now It Won't Cost You
Anything



Boole & Babbage

FCC approves AT&T's private-line rate restructuring

WASHINGTON, D.C. — The Federal Communications Commission approved AT&T's far-reaching restructuring of private-line rates to go into effect last week, subject to further investigation and monitoring for potential service delays and by-pass developments.

The effect of the changes would be to raise average private-line customer rates immediately, especially for video-graphic calls within a 50-mile radius. However, some categories of private-line service, such as Dataphone Digital Service rates, would drop in cost (CW, Jan. 28 and March 18).

The private-line rate restructuring reflects the

changes brought by the breakup of AT&T and the divided regional Bell operating companies, along with the implementation of an across change system.

During the past 15 months, the FCC and AT&T have struggled over the form of the new rate structure and have produced a system that leaves many of the decisions regarding what kind of service will be used to customer discretion.

The FCC said that while the rates that were approved "did not constitute an ideal rate structure," the imperfections will be investigated while the rates are in effect.

The commission gave AT&T six months to align its proposed rate structure for local channels with the underlying local rates that customers could also obtain from the local telephone company to reach an AT&T central office where connection to a private-line circuit is made.

The FCC also said "questions remain about some aspects of the separate structure by which AT&T offers service on its own networks" and voiced concern that "the implementation process proceeds smoothly so that alternatives provided formally in these tariff structures are actually available to customers."

AT&T's proposed discount plan for small businesses put on hold

The Federal Communications Commission suspended the May 1 start-up date for AT&T's proposed discount service for small businesses until Oct. 1, saying the carrier inadequately projected demand for the service and had not accurately estimated its competitors' pricing responses.

Called Pro-America, the discount calling plan would require customers to pay a \$15 monthly fee for which they would receive a 15% discount on message telephone service — all domestic U.S. standard long-distance calls. The plan targets customers who make more than six hours of message telephone service calls

monthly or spend more than \$167 in long-distance calls per month.

Fierce opposition to the plan was registered by AT&T's competitors, which asserted that the dominant carrier had not filed the legally required cost support documents. The argument raised was that the service was priced below cost.

The five FCC commissioners voiced regret at the necessity for delaying the service but said that AT&T, as the dominant carrier, was legally required to show how the service would pay for itself. AT&T conceded that it would not cover its costs in 1985 but would do so in 1986.

IBM CEO predicts rebound

By Patrick Smith
CW Washington Bureau

ATLANTA — John P. Akers, in his first stockholder meeting as president and chief executive officer of IBM, predicted that shipments of IBM products will increase substantially in the second half of 1985, as Big Blue rebounds from an 18% drop in earnings in the first quarter.

The first-quarter decline, Akers said, resulted from the continuing strength of the U.S. dollar in foreign currencies and from a slowdown in installations of high-end products as customers paused to evaluate the forthcoming IBM 8080 processors and enhanced 3270 storage devices.

Asked about the shortage of IBM

Personal Computer AT units, IBM officials said they are working diligently to increase production capacity, and they predicted that shipments will double in the second quarter (over the first quarter) to meet extraordinary demand for the AT.

As a large and complex business, Akers said, IBM will continue to face several competitive challenges, such as manufacturing and marketing in high volume, integrating its product line, operating in 125 countries and handling intense public scrutiny.

The computer giant also faces economic challenges from the U.S. budget and trade deficits, protectionist legislation and "a tax system in need of basic reform," Akers said.

EVERY YEAR WE REMANUFACTURE THOUSANDS OF DISC HEADS PEOPLE ALMOST GAVE UP ON.



There's no need to give up on a crashed disc head. Infoextend can remanufacture most heads and have them perform "like new." Infoextend products are part of Information Magnetics Caribe, the world's largest manufacturer of rigid media disc heads.

We remanufacture heads using the same components, and test with the same equipment as on our new head manufacturing line. The result — a remanufactured head with new head performance, without new head cost. Don't give up on your crashed heads, send them to us. We'll make them perform "like new."

Call (800) 468-2000 for the name
of the distributor near you.

**INFOEXTEND
PRODUCTS**

Infoextend Products are made by Infoextend, Inc., a subsidiary of IBM.

IBM, the IBM logo, and the name of the distributor are trademarks of International Business Machines Corporation.

The mainframe spreadsheet that's a snap!



Break away from inefficiency — with the mainframe spreadsheet that's a snap. ESS.

ESS is easy to use. And easy to install. ESS provides spreadsheet support for IBM mainframes running VM/CMS or MVS/TSO.

Now you can provide advanced spreadsheet capabilities to ten — or ten thousand users.

ESS is a fast, powerful spreadsheet that's as big as your mainframe. Spreadsheet size is limited only by your mainframe's capacity. It easily handles thousands of rows and columns.

ESS is compatible with Lotus 1-2-3 and VisiCalc. Anyone familiar with these spreadsheets can be using ESS in minutes.

And ESS has hundreds of features to support the most sophisticated applications. Macro support. Online HELP. Notation. Unfilled windows. Interactive graphics.

There's virtually no end to what ESS can do.

Give your people mainframe spreadsheet power at micro costs.

Call us today. Ask about our 30 day free trial.

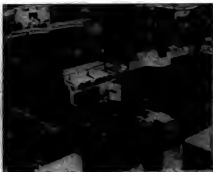


TRAX Software Inc.
2000 National Boulevard
Los Angeles, California 90008
213-675-TRAX TLR 2000-05

Trademark of International Business Machines Corporation. IBM, the IBM logo, and the name of the distributor are trademarks of International Business Machines Corporation.

NEWS

Comdex/Spring '85 opens amid stiff micro competition



Comdex/Spring '85 may attract up to 50,000 attendees.

Wave of IBM AT clones bow

By Eric Brander
CW Staff

ATLANTA — As the dog-eat-dog competition in micro-computer sales intensifies, computer dealers and other resellers will make their annual pilgrimage to Atlanta for Comdex/Spring '85.

Getting under way today, the show is expected to draw about 50,000 attendees, all looking for potential hits among the hundreds of microcomputer products making their debuts.

Comdex/Spring kicks off with a keynote address on the personal computer industry by Bud Canon, president of Compaq Computer Corp., and continues through Thursday. In addition to displays by more than 700 exhibitors, 42 technical and marketing sessions are scheduled.

On the show floor, the long-awaited wave of machines compatible with the IBM Personal Computer AT should be out in full flood, with Compaq's own entries sharing the limelight with systems from Corona Data Systems, Inc., Kaypro Corp., ITT Information Systems, NCR Corp., Televideo Systems, Inc., Texas Instruments, Inc., Zenith Data Systems Corp. and other vendors.

Another round of IBM-compatible laptop micros also will be on display, with recently introduced models from Grid Systems Corp., Morrow, Inc., Zenith Data and others.

search, Inc.'s Graphics Environment Manager software will be displayed at various booths, and Quarterdeck Office Systems, Inc. will unveil multitasking versions of its Desq operating environment program.

Samsa Corp. will introduce word processing software supporting personal computer local-area networks and the IBM Document Content Architecture, and In-

family. Hayes Microcomputer Products, Inc. will show Transet 1000, a multifunction device offering print and communications buffering, I/O switching and port expansion.

Digital Communications Associates, Inc. will introduce Irmalink/Windows, an addition to its micro-to-mainframe family. Several micro-to-mainframe products will also debut, including Quadram Corp.'s Quad 5251, an adapter card for the IBM Personal Computer that emulates IBM 5251 Model 11 and 5291 Model 2 terminals, permitting links to IBM System/24, 36 and 38 minis.

Quadram and other third-party suppliers will be showing memory boards supporting the Lotus/Intel expanded-memory specification. Enhanced graphics cards will also be in evidence. One of these, from Orchid Technology, Inc. is said to be compatible with the IBM Professional Graphics Controller and to offer 256,000 color capability.

Canon

novative Software, Inc. will show a second release of its Smart Software System.

Among communications introductions at Comdex/Spring will be various packages running on the IBM PC Network. ICOM Corp. will announce Etherbase, a network server that permits Apple's Macintosh to hook up with 3Com's Etherbase products.

Digital Equipment Corp. will launch a link between IBM Personal Computers and compatibles and its Micro PDP-11 microcomputers with an A-to-Z software

Domino of storage products will jostle for the spotlight, including a half-height Bernoulli Box cartridge drive from Jongsma Corp. and many 20M-byte hard disk drives for the IBM Personal Computer XT or Personal Computer AT.

Output devices will include a 4-b ink-jet printer and a high-speed 136-col. ink-jet printer from Epson America, Inc.

Comdex/Spring is organized by the Interface Group, Inc., which is located at 300 First Ave., Needham, Mass. 02194.

FREE BROCHURE
from Arthur Young:

"How to master Lotus,
Multiplan® or VisiCalc®
on a microcomputer."

Knowing how to use computer spreadsheets is becoming an essential business skill. Now one of the world's major accounting firms has created video based, self-teaching courses designed to get you up to speed in a matter of hours. Get details today.

Dealer inquiries welcomed.

Call or send for
free brochure.
Appropriate for individuals or small
groups. Subscriptions licenses and
unlimited use license available.

1-800-543-3450

In Mass. (617) 467-4200.

In Canada (416) 864-1235 collect.

Arthur Young

P.O. Box 646

Delmar, N.J. 02178

CICS APPLICATION
DESIGN...
WHO NEEDS IT?

You do. To meet your target dates, get the best response time, and to avoid costly conversion.

In SysEd's 4-day CICS Application Design Course you'll explore, discuss and analyze all the unique CICS facilities—their limitations and capabilities. Our lively workshop sessions and course manual use extensive and carefully designed case studies to cover in depth the most common design problem areas. Special attention is given to performance problems (how to do it better), design trade-offs (choosing one solution over another), and recovery considerations (of the system files).

Courses are held regularly at SysEd's fully equipped classroom/computer facilities in New York City, Chicago, San Francisco and Dallas. Class size is limited, no applications are accepted on a first come, first serve basis. Customized course offerings are available for on-site sessions at company installations. SysEd's courses include CICS Commerce Level, Macro Level, Internal, Application Design, Debugging, Recovery & Restart, Performance Design, and VSAM.

For information, call David Shapiro (212) 994-9147/48-49.

SYSED

35 WEST 38th ST., NEW YORK, N.Y. 10018 • (212) 994-9147/48-49

Second Symphony to debut

On the software side, Lotus Development Corp. will display the second release of its Symphony multifunction package, which demonstrates the expanded-memory scheme jointly developed with Intel Corp. Lotus also will show Symphony Link micro-to-mainframe communications software, the 1-2-3 Report Writer package and the still-not-quite-ready-for-prime-time Jazz software for the Apple Computer, Inc. Macintosh.

Additionally, Microsoft Corp. will show Macintosh applications software introduced last week; Digital Re-



"And this is where everything comes together!"

Introducing the

L5
supermicro

A breakthrough in Price,
Performance and Packaging

L5 Features

- 3.75" x 17.5" x 3.125"
- ESDI Processor, floating point, 8K cache
- 2MB or 128K memory
- 4 to 32 users
- 20MB or 2.5GB internal storage
- UNIX System V, Real Time Kernel
- Includes serial office package, memory cabling, complete documentation and manuals
- A mid-range system costs less than \$1,000 per user

Find out how the new L5 offers the unique solution to price, performance & placement challenges. Call General Communications today!



General
Communications
Corporation

1 Main Street, Suite 502, Easton, NJ 07224
(201) 542-6560

NEWS

Martin foresees coming revolution in methodology

By Jeffrey Hunter
Of West Coast Business

BAIN FRANKFORD — A "massive" revolution will soon overtake DP methodology and promises dramatic improvements in software productivity, according to information systems guru James Martin.

After a lengthy spell of relative stability, applications development today stands on the cliff edge of a period of unprecedented technological change, Martin said during a recent conference sponsored by the Institute for Information Management.

To a degree, the predicted changes in existing methodology have already begun to materialize in the form of phenomena such as nonprocedural languages and end-user computing. Other such changes lie just over the horizon.

Of the advances that have yet to emerge, none apparently holds a greater potential for boosting software productivity than the expected advent of automated development tools for program design and specification.

For more than 25 years, the procedure for specifying and designing proposed applications has remained fundamentally unchanged. Despite enormous advances in technology, systems analysts continue to do their jobs almost entirely by hand, their chief tools being paper, pencils and plastic templates, Martin said.

Even within IBM, "software people seem to think they're in a cottage industry in which they can get away with doing things manually,"

he said.

In the near future, however, the face of systems analysis will be forever transformed by the emergence of high-technology aids that will allow applications design and specification to be largely automated, Martin predicted.

The tools will enable user organizations, for the first

time, to apply the principles of computer-aided design to the task of creating software, he explained. In the past, the use of CAD techniques has been limited primarily to hardware, where their value has already been conclusively demonstrated, he said.

Automation of the program-design process is sorely needed. Also needed is a fun-

damental change in the way the system development life cycle is managed, Martin said.

Unless systems analysis and the management of development projects are significantly modernized, huge improvements in software productivity will remain elusive, he said.

With the relatively recent

advent of fourth-generation languages, programming output has reportedly risen in some cases by as much as 30-fold. But the drawback with fourth-generation languages is that their benefits extend only to the coding phase of the development process, not to system design or the definition of specifications, Martin said.

Mumps users plan meeting

CHICAGO — The 14th Annual Conference of the Massachusetts General Hospital Utility Multiprogramming System (Mumps) Users Group for professionals in medical, business, academic and scientific fields will take place June 10-14 at the McCormick Center Hotel here.

The conference will address software development, management and standards. Presentation of papers, tutorials, exhibits, roundtables and a job exchange are scheduled.

The basic registration fee is \$150, plus \$120 for full-day tutorials and \$50 for half-day tutorials.

More information can be obtained from Mumps Users Group, Suite 510, 4321 Hartwick Road, College Park, Md. 20740.

TI NaturalLink: user-friendly software with a developer-friendly tool kit.

TI makes it easier for developers to make software easier for PC users.

TI's innovative NaturalLink interface eliminates complex commands by translating them into the user's language: plain English. And the TI NaturalLink technology tool kit lets you develop interfaces for new or existing software in a way that speaks your language: simplicity. And better sales.

The tool kit contains all the software and manuals you

need to design, develop and test NaturalLink applications—quickly—on the TI Professional Computer. And our NaturalLink

You're speaking my language, TI.
☐ Please send me more information.
☐ Contact me to arrange a demonstration.

Name _____

Company _____

Address _____

City _____

State _____ ZIP _____

Mail to: Texas Instruments Incorporated
P.O. Box 59590, Dept. 000000
Dallas, TX 75259-0590

IBM® option contains the linkable object code you need to run your programs on the IBM PC, XT, AT or compatibles.

For more information or a demonstration, call us at 1-800-527-3500 or mail the coupon. We'll prove how developer-friendly we can be.

**TEXAS
INSTRUMENTS**
Creating useful products
and services for you.

End users gaining clout in question of micro use

By Charles Sabatini
Of New York Times

NEW YORK — Although MIS departments have resorted to control over the acquisition of microcomputers, and users — not MIS policies — will dominate how the micros are used, according to a panel on "Opportunities in Personal Computing."

The panel was part of a recent two-day seminar here on the opportunities in management information, sponsored by the Conference Board, a business research group.

Speakers included Joseph T. Brophy, senior vice-president of data processing for Travelers Corp., whose workers use 9,000 micros; Michael J. McLaughlin, senior vice-president of information systems and services for New York Life Insurance Co., which has placed approximately 3,000 IBM Personal Computers on the desks of its agents; and Michael J. Intile, vice-president of information services at Central & South West Corp. (CSW), a utility conglomerate in Texas that uses 530 micros.

Intile said that his MIS department is expected to help acquire microcomputers, but the end users get control over their use. End users may select whatever brand they wish.

"That's no easy task in terms of managing my people. They say, 'Look at the dumb thing this user did.' They're upset because they can't be in charge," he said.

When CSW users want to do projects on their micros, the MIS department works with them, but the users direct the projects. An executive in the user's department must sponsor it, and it is financed out of the department's budget, Intile said.

"It's important [for me] to see a commitment from [the users]. If [they have] that commitment, [they] will stay up 16 hours a day to make it work," he said.

CSW tries to distribute a new program to its micro users each month, either one written in-house or one in

the public domain. The free software encourages users to experiment, Intile continued, and it broadens their idea of what microcomputers can do.

According to Intile, his company estimated that the computers pay back their \$3,000 to \$4,000 cost if employees save one hour a week or 2.5% of their time a year. "They're very simple tools to cost-justify," he said.

Microcomputers are supported by a regularly published personal computer users list, a walk-in information center, a micro hot line and on-site consultation. In addition, his department supports many software packages, including Lotus Development Corp.'s 1-2-3, Cullinet Soft-

ware, Inc.'s Goldengate, Ashton-Tate's dBase III and IBM's Displaywrite 2. The microcomputer is the latest tool in advancing "the free-enterprise spirit" of his company, Intile said.

Both Brophy and McLaughlin said their MIS departments took a stricter view of cost-justifying micros, and the IBM Personal Computer XT was a de facto standard in their organizations. At Travelers, each purchase must be authorized by a central review group, Brophy added.

He said that Travelers is concerned about providing a secure environment in which micro users can operate, because many of its micros are connected to the company's 16 IBM

3084 mainframes under TSO. That tie also gives micro users access to Travelers' national network and data base management system, he said.

Travelers sells integrated financial services in a competitive environment, and microcomputers help it provide quick responses to customers, he noted. By 1990, many transactions will arrive at and leave company offices "untouched by human hands," he said.

In addition, micros are instrumental to staff changes in the company. In 1970, Travelers used two clerks for every professional, such as an account representative or an agent; by 1980, it will use two professionals for every clerk, he said.



How to turn a DOS hog into a CCA racehorse.

Our MODEL 804 software system will transform your DOS productivity into a completely different animal. In fact, MODEL 804 increases efficiency sufficiently to pay for itself. And, in only one year.

One reason for its efficiency is that it's the only system of its kind with direct teleprocessing interface. Which decreases processing time and saves system resources dramatically because you don't need a separate TP monitor.

Not only will you get new applications up faster, but applications and data bases will be easier to maintain. In fact, MODEL 804 is probably the only data management tool you'll need.

And for management personnel who aren't computer experts, MODEL 804's fourth generation tools make it easy for them to query and gather information from its relational database.

Consider upgrading your DOS productivity capabilities to 30 times. Overnight, with CCA's MODEL 804.

Send the coupon for more information fast. Or call, 1-800-328-4000.

Send name MODEL 804 facts fast.
Mail to: Peer Cambridge Corp., Cambridge, MA 02142

Name
Company
Address
City State Zip
Telephone
Computer CCA

**Computer Corporation
of America**
A Camtech Company

GROW YOUR OWN CICS PROGRAMMERS.

The CICS programmers you need may already be working for you—because SysEd training makes even non-CICS programmers immediately productive in a CICS environment.

SysEd's challenging, "hands-on" training lets you upgrade your present programming skill, and saves the time, effort and expense of hiring new personnel.

Our experienced instructors specialize in using real-life programs and design problems. Whether the course is Command Level, Macro Level, Internal, Application Design or Visual, we encourage students to bring in their own projects to enhance the workshop sessions.

Courses can be held at your company on your computer or at SysEd's fully-equipped classroom/computer facilities in New York City.

For more information, call Dave Shapiro (212) 584-0147.

SYS-ED

35 West 51st Street of 7th Avenue
New York, NY 10019

Software Innovators creating better ways to manage business.

INTRODUCING THE HEWLETT-PACKARD TOUCHSCREEN

II

OFFICE AUTOMATION MADE EASY. POINT BY POINT.

With the new Touchscreen II, it's easy to put your finger on a problem (and a solution). Simply point at what you want.

When you take a look at the Touchscreen II, the first thing you'll see is our new high-resolution 12-inch screen.

The new Hewlett-Packard Touchscreen II personal computer is the mainstay of an office automation system designed to be easy.

Easy to learn ■ Easy to operate ■ Easy to place in an office information network.

In short, Touchscreen II makes it easy to be productive ■ Here are a few pointers.

WHEN YOU SEE WHAT YOU WANT, POINT.


Sit down to work, and Touchscreen II displays a selection of application software on a high-resolution 12-inch screen.

Find the one you want to use, then touch the point on the screen where it appears ■ Instantly, the program is activated.

You're freed from typing complicated gibberish commands ■ Simply look, touch, and move on.

THERE'S PLENTY TO POINT TO.

Touchscreen II allows you to choose from over 600 of the most popular business software packages ■ In addition, you can use Hewlett-Packard's own software library ■



Including our new Graphics Gallery, which offers you presentation graphics of a quality previously available only from larger computers. And, with HP's new Executive MemoMaker, it's easy to merge graphics with text—right on the screen.

Most of these packages are enhanced through the use of touch and soft keys, which execute complex commands in one stroke. This not only speeds the operation of *Touchscreen II*, it speeds the learning process required to use it.

EVERYONE IN YOUR OFFICE WILL GET THE POINT.

Touchscreen II requires minimal orientation, even for the beginning user. This is largely due to an ingenious system called Personal Applications Manager, or PAM.

PAM displays program applications as English-language labels. These labels, when touched or activated through soft keys, get you into programs immediately.

PAM also enables you to accomplish a number of common jobs—such as switching from pc to terminal mode—with a single keystroke.

Touchscreen II is easily set up for peripherals like printers and plotters, thanks to the pictorial menu. Simply touch the pictures that match the devices in your system.

GET YOUR POINT ACROSS.

Touchscreen II makes it easy to communicate.

Built-in terminal capabilities and a variety of data communication devices allow *Touchscreen II* to exchange information with Hewlett-Packard, DEC and IBM host computers. Acting as a terminal, *Touchscreen II* enables you to tap into the power of these larger computers, making use of their software, databases and peripherals.

Touchscreen II will also relay information among pc's (including IBM) and peripherals as the hub of a 3Com[™] Ethernet Local Area Network.

A BIG HAND FOR OUR PERIPHERALS.

Plotters, LaserJet and ThinkJet printers, mass storage devices, user interfaces and more are available from Hewlett-Packard.

And they're all built to Hewlett-Packard's meticulous standards of quality. Not merely quality of construction. But a quality of thinking that precedes it.

If you'd like more pointers on the quality and simplicity of the new *Touchscreen II*, call us toll-free at 1-800-FOR-HPCC, Dept. 282A, for the name of your nearest Hewlett-Packard dealer or sales office.

The more you simplify, the more you'll produce. And productivity is, after all, the point of this discussion.

3Com[™] is a U.S. trademark of 3Com Corporation.



**HEWLETT
PACKARD**

NEWS

Micro-mainframe link use varies with cluster size

By Kathleen Burke
Clt West Coast Bureau

SAN FRANCISCO — The use of micro-mainframe link technology as a solution to end users' problems and as a tool allowing corporations to make realistic plans for the future is not a straightforward proposition.

So said members of a panel on micro-mainframe links at

the Association of Data Processing Service Organizations, Inc. meeting here recently.

Micro-mainframe link usage depends significantly on the size of the personal computer cluster involved, according to John Worthen, president of Focus Research Systems, Inc. in West Hartford, Conn., who said his

company recently completed a survey of micro-mainframe link requirements of MIS managers at 112 IBM mainframe installations throughout the U.S.

The statistics revealed that 74% of the sites surveyed had less than 25 IBM Personal Computers, and 26% had more than 100 personal computers. Of these,

80% of the users with more than 100 micros used the links to access corporate mainframe data, while only 40% of the sites with less than 100 personal computers did.

According to Worthen, 65% of all the personal computers were used in plain vanilla applications and were connected to mainframe el-

ther for terminal emulation or data transfer.

The statistics also showed that installations with less than 100 microcomputers had hard-wired local connectivity at 60% of the sites, and remote telecommunications connections at 40% of the sites, while larger sites reversed those figures, Worthen said.

This had a ripple effect on connection speeds, with small sites, which had a predominance of local loops, transferring 10% of the data at 2,400 bit/sec. or less and large sites, which had a predominance of remote telecommunications setups, transferring 26% of the data at less than 2,400 bit/sec. These figures were directly related to the local vs. remote connectivity situation, Worthen said.

Worthen also said that future micro-mainframe link usage would increase 90% during the next five years at these sites, but that users felt there were many obstacles that stood in the way of progress — data security issues, degradation of network performance and the dispersal of MIS control throughout separate corporate divisions.

Difficult to plan

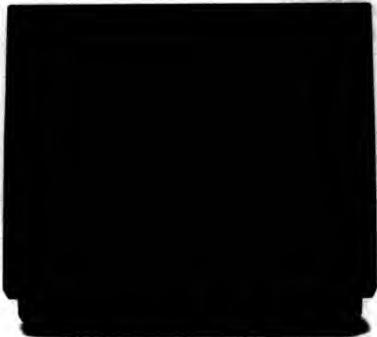
Today's micro-to-mainframe links make it difficult for corporate users to plan effectively for future requirements, said David Ferris, chairman of Ferrin Corp., based here, which provides hardware and software services to micro users in Fortune 1,000 companies.

He added it will take three to five years for the technology to provide shared specialized peripherals, so let micro batch data updates into mainframes or to allow communications tools to be built into individual systems.

The major complaints from corporate users about micro-mainframe links center on the links' inability to extract only the required data, to link data relationally and to upload data easily to the mainframe data base, Joel Isaacson said.

Isaacson is president of the Personal Computer Professionals Association in Los Angeles, a service group that selects and evaluates products for corporate users. He is also chief of the Information Services Division at Carter-Hawley-Hale, a \$4 billion retail organization based in Irvine, Calif.

Isaacson said that users were clamoring for micro-computer products to organize host data into standard formats for extraction, to provide standard workstation formats for transferring data and to provide user-friendly extraction programs.



A NUMERICAL CONCEPT NO OTHER MONITOR CAN COMPREHEND.

As sophisticated as they are, you'd think monitor companies could solve a simple problem: keeping customers happy.



Fortunately, Amdtek can. With the longest warranty in the industry. Namely, two years on all parts and labor. And three years on the CRT.

Even simpler, our warranty applies to every monitor we make, from our new Color Series to our amazingly popular Velcro Series.

And Amdtek's own trained technicians make repairs quick and professional.

So when you're shopping for a monitor, look at the quality Amdtek guarantees you, years after you leave the store.

According to our figures, it really adds up.

AMDEK MONITORS

Amdtek Corp., 2001 Leidy Blvd., Elb Centro Village, E. 60002 342/595-6890, Telex 280323

NEWS

NCR unveils IBM AT clone

By Charles Redwood

NEW YORK — NCR Corp. announced a desktop computer, said to be IBM Personal Computer AT-compatible, that will be available in August and priced 5% less than the AT's list price.

Dubbed the PC8, it will run under the NCR-DOS 3.1 operating system, capable of using software designed for the IBM Personal Computer family. It will also run Microsoft Corp.'s Xenix for a multi-user environment, company officials said.

Both the Personal Computer AT and the NCR model use the 6 MHz, 16-bit Intel Corp. 80286 microprocessor.

The PC8 will come in two models, one with 256K bytes of random-access memory (RAM) and one with 512K bytes of RAM, expandable to 4M bytes.

The basic model has a single, half-height 5¼-in. floppy disk drive with 1.2M bytes of storage.

The enhanced model has the same 1.2M bytes of floppy disk storage, along with a 30M-byte, full-height, hard disk drive, expandable to 40M bytes, company spokesmen said.

Added features

NCR claimed the micro offers additional features that add value to the IBM Personal Computer AT clone: a 460-by-400-pixel monochrome or color monitor gives higher resolution than the IBM Personal Computer monitors, but can display Personal Computer graphics; an optional 10M-byte streaming tape drive serves as a data backup device; and a keyboard with 50 programmable function keys eliminates the need to use the shift key with the function keys.

Up to 16 users may connect to the PC8 at one time, said Vernon W. Yates, general manager of NCR's personal computer division. Yates acknowledged that machine performance would slow, depending on the application being run, as more and more users hook up to the machine.

The IBM AT is limited to three users. IBM observers say the limit allows a decrease in machine performance with disk-intensive tasks such as word processing. The PC8 has the same average disk access time as the Personal Computer AT, Yates said.

The basic PC8 will sell for \$3,795; the enhanced version will cost \$5,505, spokesmen said. Volume shipments will begin in the third quarter.

NCR officials also announced the following:

■ The PC8, an IBM Personal Computer XT-compatible based on the 16-bit, Intel

8086-2 that is said to be up to 30% faster than the XT. It will be available in July for \$2,595 for a basic model that comes with a 160K bytes of RAM, expandable to 640K bytes; one 30K-byte floppy disk drive; one 20M-byte, half-height hard disk drive; and a 10M-byte tape streamer drive for backup.

■ A Retail Personal Com-

puter, combining NCR's already released PC4 with software and peripherals, including a cash drawer that allows it to function as a point-of-sale terminal. Its price ranges from \$4,531 to \$5,091. It is available immediately.

NCR's headquarters are located in Dayton, Ohio 45479.

Directories List 32,000 D P Users

Each directory of computer installations lists 16,000 computer users covering the NY Metro Area (NY, NJ & CT) and the Mid-Atlantic States (PA, VA, MD, DC, WV & DE). Each site includes a profile of the hardware installed, software installed, (languages, databases, etc.), commands used, future

plans, applications and DP executives' names, titles, and phone numbers. An index provides quick access to 135 cross references by hardware, software and industry. Price: NY-\$570 and MA-\$295. Call (212) 683-6696. Computer Management Research, Inc. 30 Westside Plaza, NY; NY 10019.

Do you know who's accessing your CICS system?



ALERT/CICS® customers can rest easy. They know that ALERT/CICS is not only easy to use, but is also a comprehensive CICS security system.*

With ALERT/CICS each authorized user is only permitted to access the transactions, programs, files, and fields within scope that were defined for that user. Terminal security is also

available for each of these access levels.

ALERT/CICS customers also love its modular design. They can turn on as much or as little security as they want. This makes it easy for them to "phase in" ALERT/CICS's security.

But what really makes ALERT/CICS great is that it's completely man-

driven. ALERT/CICS customers do not have to learn a rules language. They simply fill in the blanks of the security screens.

So if you're uncertain about the security of your CICS system, call us today at 800-848-0848 to find out more about ALERT/CICS. And start resting easy!

**THE
COMPANY
TO WATCH**

**Goal
Systems**
Software Solutions

Goal Systems International, Inc.

IDMS/R is proving to be what most people expected it to be: Simply the best.

For nearly a decade, in survey after survey of the data processing community, one database management system was consistently rated first in user satisfaction—IDMS.

So when we announced IDMS/R in April of 1983, expectations naturally were high for a versatile database management system that would combine the ease-of-use of a relational architecture with high performance.

That was the promise we made. And that, in fact, is the product we've delivered.

With IDMS/R, people whose only data processing experience is an encouraging "you can do it" from the dp department are finding themselves able to create their own customized applications. They're doing it quickly, easily and, best of all, *independently*. And that comes as a welcome relief for overburdened dp personnel.

As for complex, high-volume production applications, IDMS/R is without peer. Thanks to the unique architecture of IDMS/R, data processing can tune the database and thereby benefit from a dramatic boost in performance. Moreover, IDMS/R has the most sophisticated back-up and recovery capability of any database management system—an absolute must for on-line applications.

The
**Complete
Software
Solution**



And when one considers that IDMS/R is the cornerstone of the only information management system available today that fully integrates database, applications and decision support software, choosing a relational dbms becomes a very simple decision.

To attend a Cullinet Seminar, phone, toll-free,
1-800-225-9930. In MA, 617-329-7700.

Cullinet

We understand business better than
any software company in business.

© 1983 Cullinet Software, Inc., Watwood, MA 02152-2000

NEWS

Stuff it to JES

CCS, DDFprint, RMS, and SAS* Reports

The Dynamic Report System provides a bridge between on-line systems and the JES report queue. Move it all to JES and gain performance along with centralized report distribution. Let JES account for, archive and distribute reports to 327X printers, local printers, PCs, plotters, microfilm devices and 3270s.

And Let JES Distribute Your 328X Reports

VPS, the VPM/ICAM Printer Support subsystem places 328X/328X printers, PCs, plotters, 3270s, and word processors directly under JES. These remote dedicated devices become JES 328X print stations. VPS expands JES's local and remote hardcopy alternatives as it reduces real network costs and complexity. Ask our 400 users and their 20,000 printers.



Levi, Ray & Shoup, Inc.
PO Box 5000 Dallas, TX 75205
DALLAS (214) 350-0926 - TOLL-FREE 800-458-4444
*A registered trademark of the SAS Institute

End-user computing varies with corporate culture

By Kathleen Bertke
CW West Coast Bureau

SAN FRANCISCO — Corporate perspectives toward end-user computing vary with corporate cultures, according to industry executives who direct such activities at major U.S. corporations.

Speaking at an Association of Data Processing Service Organizations, Inc. (Adapso) panel on end-user computing, held here recently, C. L. Hodges, supervisor of the Personal Computer Services Center for Chevron Corp., said his department tests and evaluates hardware and soft-

ware for end users, communicates with vendors, coordinates user training and staffs a user-support hot line.

One problem at Chevron, Hodges said, is that it takes 30 days for a Chevron end user to obtain a personal computer, once it is authorized, due to Chevron's lengthy approval cycle for end users. Hodges said the cycle includes reviews by Chevron's applications manager and its data communications group.

"A five-week review is an inordinately long time, especially given the short product life cycle of personal computers today," Hodges said. Chevron is in the process of cutting its review procedure down to 10 days, he said, by processing end-user orders electronically using IBM's Professional Office System and by warehousing commonly used hardware and software.

Lee Milligan, manager of financial information services at Apple Computer, Inc. in Cupertino, Calif., said that at Apple, the choice of computer hardware, software and service is left up to the end user, without the intervention of a centralized MIS department.

Rather than using an MIS department, each Apple product group decides autonomously how a computing task should be handled, Milligan said. At Apple, 50% of the computing tasks are handled by desktop personal computers, and employees are encouraged "to stay off mainframes and minis," he said.

There are problems with this autonomous approach, however, Milligan said. Information is not easily transferred between personal computers, and it is much harder to manage data.

Milligan said the benefits of allowing end users to choose their own computers far outweighs the disadvantages. Among the advantages are that they are lower computing costs and that Apple's mini and mainframe computers are freed for other tasks such as distribution, manufacturing and payroll.

Robert F. Berland, IBM's director of strategic planning for MIS in Armonk, N.Y., said today's information overload makes it difficult for end users to decide what software or networking services to use.

The most crucial requirement for end-user software at IBM is ease of use, typified by transparent data extraction and archiving, he said. The ideal end-user computing setup at IBM would leverage existing technology to link intelligent workstations, departmental micros and mainframes, Berland said.

Coby Dunn, vice-president for end-user computing at the Bank of America in San Francisco said that typical Bank of America end users have minimal computer expertise and no formal applications development training. Their requirements are largely the sharing of corporate data, integrating inquiry and analysis and generating applications development without programming, he said.

According to Dunn, Bank of America is working on a three-tiered delivery strategy for its end users, using workstations, distributed systems and mainframe computers.

SECURITY, NATURE'S WAY.

Our Security System Does Something Nature Doesn't Do. It Protects The Data In MVS, VSI And VM Environments.

Only one security software is the accepted standard for OS/VS environments: ACF2, Access Control Facility.

Over 1500 organizations, including many Fortune 500 companies, trust ACF2 for access control because it gives peace-of-mind against unauthorized disclosure, modification, or destruction of data. ACF2 is also rated as C2, the highest rating awarded by DoDCSC for OS/MVS.

With ACF2, all data is protected automatically — by default. Authorization access is granted based on a need to know. This avoids confusion, assignment mistakes, and overights.

Installation is fast. Implementation is painless. Critical data sets can be protected first, while less critical data can be secured in stages to avoid disruption of daily work routines.

All system resource accesses are monitored and controlled as they occur. A complete audit trail provides total accountability.

Surprisingly, all this control uses a minimum of administrative and machine overhead.

To see the security software that makes the data work your system, call or write John Williams direct to arrange a presentation.

The Cambridge Systems Group

34275 Elms, Los Altos Hills, CA 94022, U.S.A.
(415) 944-4858 • Telex 359437



The One™
you've
seen.

The one
to
buy.

Lowest the idea of a small,
lightweight computer
as powerful as an IBM®
PC. That's the LCD
screen at any angle! So
you didn't buy the One!



Your IBM PC's not 3½
inch disk. The One™
takes 3½ inch. No fit?
No chance.



\$4,575 when equipped
to run Lotus® 1-2-3®
on the road.

Pivot™ It's new
LotusCan™ screen is
a breakthrough in port-
able screen technology:
25 lines x 80 columns
that read like a computer
instead of a fifth column!

Built-in modem is
300/1200 baud and
Easy-to-use.
The One™ is out.



Lotus-ready and
travel-packed at \$3,995.



Runs all the IBM®
PC software you've
already purchased,
including Lotus® 1-2-3®
and Flight Simulator®.
Or your company's.
Plug in a monitor (RGB
or monochrome). Serial
or parallel printer. Or an
expansion bus for hard
disk, more graphics,
EISA, whatever. Modems
Plasma has it done.

Dual 5¼-inch disk drives
match the IBM® PC.
Disks can travel from
desktop to portable and
back. Smart move.

The carry-along IBM® PC is a great idea. And the new PIVOT™ II portable business computer finally makes it work.

PIVOT™ II doesn't make you strain your arms, your eyes, or your budget to take your IBM PC software on the road. It runs on AC or built-in battery. It carries comfortably in an over-the-shoulder case with room for your papers and journals. And it computes like crazy when you get there. Our exclusive new low-power screen technology is bright, crisp and easy-to-read in any light. And the Lotus-ready price won't raise a flag with your CFO.

For the nearest place to buy a PIVOT™ II, call 800-521-3493 (in California, 415-568-8599). If you want more than One, call Morrow direct at 415-430-1970.

MORROW ■

Pivot™ II
The turning point in portable computers.

See us at Booth #2830.

*This is the best we could do for both screens. Really. Check them out in person. DATA GENERAL/One is a trademark of Data General Corporation. IBM is a registered trademark of International Business Machines Corporation. 1-2-3 and Lotus are trademarks of Lotus Development Corporation. Pivot and LotusCan are trademarks of Morrow Design, Inc.



FRANCE

PARIS — ICL Co. has introduced the System 39 Level 30 and System 39 Level 80 mainframes, which will replace the company's 3900 line. The machines are intended to compete with Digital Equipment Corp.'s superminicomputer line and with IBM's 4361 and 5085 systems. The machines, available in single and dual versions, are based on Cmos technology and run under the VM operating system.

PARIS — Negotiations reportedly are under way between France's Alcatel and Altos Computer Systems, Inc. The French company is said to be interested in Altos' recently unveiled 3085 microcomputer, which reportedly is the first supermicro based on the 32-bit 68020 microprocessor from Motorola, Inc.

JAPAN

TOKYO — Japan's Agency for Cultural Affairs has announced a revised copyright law that includes software program protection. Effective Jan. 1, 1986, software will be registered and illegal to copy. To date, there has been little effort to monitor or discourage illegal use of software in Japan, and it is unclear how the new legislation will be enforced at this point.

TOKYO — Fujitsu Ltd. began a field trial of an integrated services digital network (ISDN) last month with an unnamed communications company in Singapore. The ISDN was designed to integrate facsimile, voice, graphics and data transmissions over a digital communications network, according to a spokesman. The field trial is intended to test multiple types of media in a single network based on CCITT standards. This reportedly requires the integration of hardware and software upgrades at three switching stations, use of digital telephone, facsimile machines, personal computers and

other terminals.

TOKYO — NEC Corp. and NEC Toshiba Information Systems Ltd. jointly introduced the Acoz System 610 mid-range mainframe and the Acoz System 630 high-end mainframe. The systems feature large-scale integration and run under the Acoz-4/MVP operating system. The Acoz 610 is available in single- and dual-processor versions, offering 16 and 24 ports, respectively, and has memory ranging from 4M to 40M bytes. The 630 is a single-processor system with 8M to 32M bytes of main memory, 64K-byte cache memory and 24 channels, the vendor said.

TOKYO — Fujitsu Ltd. has added a high-end and low-end to its supercomputer line. Facom VP-400 is said to perform at 1.140 floating point operation/sec. (Flops). The entry-level Facom VP-60 reportedly operates at 140 MFlops and is field upgradable to the firm's existing VP-100 and VP-200 supercomputers.

WEST GERMANY

FRANKFURT — The West German business personal computer market grew 44% in 1984 — to 140,000 units sold — according to a study completed

by Diebold Deutschland AG. The most popular personal computer in West Germany last year was IBM, with 30% market share, followed by Apple Computer, Inc., with 16%, and Olivetti Corp., with 9%. Experiencing decreases in shipments last year were Commodore Business Machines, Inc., Victor Technologies, Inc. and Hewlett-Packard Co. Personal computer sales have stagnated in West Germany without reaching the saturation point, the study concluded.

MUNICH — Although Systems '85 Industry Show for Computer and Communications is still six months away, Munich's biannual computer show has already booked more computer exhibitors than the World Center for Office, Data and Communications Technology segment of the Hannover Fairs.

The popularity of Systems '85 appears to be growing. The show had only 962 vendors in 1983, compared with 1,400 vendors signed up for this year's Oct. 25 through Nov. 3 event (150 of which are American firms). No longer considered a regional show, Systems '85 could strip the Hannover Fair of its standing as "Queen of Germany," according to industry sources, because of the show's sophisticated schedule.

Uptime

Provide 24 hour CICS access

CICS Dynamic File Allocation is a must for effective CICS scheduling. It is the gateway to non-stop, round-the-clock CICS systems. It eliminates batch update constraints. It guarantees bulk proof returns. It allows you and your batch jobs to add and remove CICS files at will, without disrupting your user community. See Screen 33000.

Read JES Reports from CICS

Give your CICS terminals and PCs access to JES reports. List and save (1) browse time critical reports, (2) control report distribution, and (3) schedule and submit their own jobs. The CICS Queue Command Facility (CQCF) is an efficient, cost effective tool for retrieving and controlling JES II reports. See Screen 33000.

NETEL

Netel International, Inc.
P.O. Box 18238 • Dallas, TX 75218
214/294-2848 • Telex 95-4234

German micro mart slows

STUTTGART, West Germany — IBM Deutschland GmbH presented a "first" at a press conference here last week: its consolidated balance sheet for 1984. Along with downplaying the company's sluggish Personal Computer sales, IBM announced a modest gain in revenue for 1984, which was up just 6.2%, compared with its healthy 15.2% jump in 1983. The company's 1983 profit margin of 6.4% remained unchanged in 1984. Last year IBM emphasized a considerable expansion of its Personal

Computer business, and this year that was a favorite topic. The Personal Computer business accounted for just 1% of 1983 revenue here. One year later that figure is three times as much, said Lothar Spierberg, IBM Deutschland general manager. That means 3% of revenue, approximately 8100 units, can be attributed to the Personal Computer. IBM did not mention any sales figures, but inside sources estimate that no more than 30,000 Personal Computers were sold in West Germany in 1984. These figures show a stagnation in the West German marketplace.

Diebold Deutschland AG recently released annual figures on market share in West Germany that offer another angle to IBM's position here. Based on the dollar value of installed base, the figures illustrate a decrease in IBM's market share from 28.4% to 27.1% — including micro, minis, small business systems and mainframes — to primarily benefit German competitors Nixdorf Computer and Siemens AG. Meanwhile, both of the latter firms enjoyed growth rates above the industry average of 15%.

According to industry sources, other West German subsidiaries of American computer vendors have lost relative market share in West Germany during 1984. These include Amdehl Corp.; Burroughs Corp.; Control Data Corp.; Datacube Corp.; Management Assistance, Inc.; Mohawk Data Sciences Corp.; National Advanced Systems Corp.; Sperry Corp.; Storage Technology Corp.; Texas Instruments, Inc.; Wang Laboratories, Inc.; and Xerox Corp.

Among the successful American subsidiaries whose businesses all grew in West Germany last year were Commodore Business Machines, Inc.; Data General Corp.; Digital Equipment Corp.; and Hewlett-Packard Co.

BENEFITS:
No phone trunk, no modems, no cables to transmit data and voice.

SOLUTION:
Choose the UNIMUX FM 632 & FM 638 and Fibronics fiberoptic cable to transmit data and voice.

PROBLEM:
Now wing on plant needs 32 IBM® and 16 ASCII peripherals plus 80 phones... total 128 channels.

APPLICATION NOTE #3

When you find 80 to 128 channels that need separate channels, Fibronics has the solution. Choose the UNIMUX FM 632 & FM 638 and Fibronics fiberoptic cable to transmit data and voice. See our Application Note #3 for details. Call (817) 778-0700 today and let us show you how easy Fibronics makes the shift.

Fibronics CURES THE BLUES

325 Glenview Street, Houston, TX 77001
Tel. (817) 778-0700 Telex 951297

NEWS

System manages savings for manufacturing firm

OKLAHOMA CITY — A manufacturing company here saved \$1.8 million after it installed a system to help manage its manufacturing operations.

CMI Corp. builds controlled asphalt plants, oil field products and road construction equipment and most often builds small quantities of many products, said Larry J. Farley, manager of manufacturing systems implementation.

In mid-1983, CMI installed a Sperry Corp. 1100/61 computer with eight 9470 disk drives and 100 user terminals, Farley said. CMI bought Sperry's Unis material requirements planning system and Mapper, Sperry's report and applications development system, he added.

Sperry's Unis manufacturing software started in a pilot mode for the company's pump-unit manufacturing line in December 1983, with eight Unis modules — including inventory management, inventory accounting,

There are now more than 200 Mapper system users with more than 400 applications at CMI, Farley said. Typically, a user will put together two or three different reports, each taking about five minutes, then enter the necessary data and start manipulating or doing calculations with it, he said. If the user needs help, Farley or others can assist him, he added.

The company saves 12 to 16 man-days per month by using Mapper to prepare spreadsheet reports that formerly were calculated and typed, explained Mapper coordinator Richard Lee. CMI page 30



CMI production planner Ed Bergen shows a Mapper screen.

CMI's system enables Larry Jack, purveyor unit manufacturing, to produce an efficiency report on a unit just completed.

bill-of-materials and order entry — and CMI's complete customer file, Farley said.

Savings in purchases

The company saved about \$1.8 million in raw materials purchases, labor and the carrying costs of inventory, partly because the Unis system pointed out an overstock in pumping unit subassembly component inventory, Farley said. The company was able to use up the excess components, rather than fabricate new items, he said.

Farley found that Sperry's Mapper system, an interactive report and applications generator, lets his personnel build their own data bases and reports so they can make changes to reports quickly, he said.

The Mapper system speeds user acceptance of the Unis manufacturing and resources management system, Farley said. Mapper is unable to access the data base, but can pass a request to a Cobol program to pull the data from Unis out into Mapper so the user can manipulate it, he said.



Applied Digital Systems Inc.
A Subsidiary of NCR Corporation
100 Mission Blvd., Pittsburgh, PA 15106 USA
Tel. (412) 351-0100 • Telex 510-027-0000 • Fax (412) 351-7210
Please Note: A representative contact list, classified as the ADSS Visually Transmitted.

Name _____
Title _____
Company _____
Street _____ City _____
State _____ Zip _____

NEWS



CMI's management system streamlines data.

CMI from page 29

Wooten. In the past, two monthly comparisons of product costs for upper management and sales each took three to four days to prepare, Wooten said. Now, producing four of the reports takes a total of two hours.

About 2½ hours per week are required to enter and analyze time-card data — a task that previously took 20 man-hours per week, he said.

A production control supervisor who is a beginning Mapper system user recently spent 30 minutes putting together a six-month forecast on after-market sales of approximately 1,100 manufactured parts, Farley said. His manager wanted information about the quantity on order and the quantity on hand added to the report, and Farley added the extra information in about five minutes, he said. Then, top management saw the report and asked that unit costs and extended cost data be added too. It went back to Farley for another five minutes of work, and the result is a document now valuable at several levels, he said.

Some of the marketing staff at CMI changed their minds about getting their own microcomputers because they discovered the information they wanted was available through the system, Farley said. He added that extensive quality-control reporting and auditing is now on the system, too. It serves to keep track of parts ordered, reject information and the responsible department, he said.

CMI is extracting parts description and cost data from almost every Mapper system application, Farley said. This eliminates an operator having to key in the information, and it also automates the costing of almost any parts report when management wants cost data, he said.

The Mapper application that most CMI people come in contact with is a combined production/service parts shortage report that includes expediting information, due dates and promised dates and other information by department and manager so the manager knows just what machine has been held up, Farley said. This comes out each morning, or more often if necessary, in about 20 copies, which are not identical, according to Farley.

DPMA to offer May seminars

PHILADELPHIA — The Data Processing Management Association (DPMA) here will host three morning seminars at the Sheraton University City hotel here during May.

The topic on May 15 is "Decision Support Systems and the Office of the Future"; on May 22, the theme is "Micro-to-Mainframe Linking Within the Information Center"; and on May 29, the seminar theme will be "Application Development Tools."

The sessions cost \$40 each for members and \$50 each for nonmembers.

More information is available from the DPMA of Philadelphia, P.O. Box 2367, Philadelphia, Pa. 19103.

IBM announces grant recipients

ARMONK, N.Y. — IBM has donated \$27 million worth of cash and equipment that will be shared among 13 universities for programs to enhance graduate-level MIS education.

The grants are designed to help graduate schools prepare students to manage data bases, DP equipment and software, IBM said. With the grants, universities can improve curricula and develop courses leading to advanced MIS-related degrees. Each school will receive up to \$1 million in cash and up to \$1 million worth of IBM hardware and software.

The 13 universities were selected from 77 schools that submitted proposals in response to IBM's announcement of the grant program in April 1984.

The universities include the Claremont (Calif.) Graduate School, Georgia State University, Indiana University, MIT, the University of Arizona, the University of California at Los Angeles, the University of Georgia, the University of Illinois at Urbana-Champaign, the University of Minnesota, the University of Pennsylvania, the University of Pittsburgh (Pa.), the University of Rochester (N.Y.) and the University of Texas at Austin.

IBM is located in Armonk, N.Y.

This
works,
but
what's better?

MITRON...STD 1600

- Tape-to-tape data transfer.
- Off-line to any remote site.
- Fast!

MITRON...We provide simple solutions.

Call 800 638-9665 (Maryland 301 992-7700).

MITRON

Systems Corporation • 2000 Century Plaza, Columbia, MD 21046

**COMPTON
FOR PAPER
USERS**

Compton's new line of paper-based computers is designed to meet the needs of the paper-based computer user. The new line includes the Compton Paper-Based Computer, the Compton Paper-Based Computer II, and the Compton Paper-Based Computer III. The Compton Paper-Based Computer is a desktop computer that can be used for a wide range of applications. The Compton Paper-Based Computer II is a desktop computer that can be used for a wide range of applications. The Compton Paper-Based Computer III is a desktop computer that can be used for a wide range of applications.

Compton's new line of paper-based computers is designed to meet the needs of the paper-based computer user. The new line includes the Compton Paper-Based Computer, the Compton Paper-Based Computer II, and the Compton Paper-Based Computer III. The Compton Paper-Based Computer is a desktop computer that can be used for a wide range of applications. The Compton Paper-Based Computer II is a desktop computer that can be used for a wide range of applications. The Compton Paper-Based Computer III is a desktop computer that can be used for a wide range of applications.

COMPTON

For more information, contact your local Compton representative.

NEWS


**TURNAROUND
TIME**
Larry Long

Q While I have some sympathy for the difficulties encountered by personal computer software vendors protecting their proprietary interests, their stipulations on copying are impractical in a corporate environment. The current public relations campaign to get the public to conform to licensing protocols leads me to wonder whether our current practices are ethical.

We would never knowingly cheat or defraud anyone. However, our own procedures for distributing personal computer software within our own organization do not conform to the many and varied forms of words that software vendors wrap around their licenses.

We buy licenses for every personal computer that runs licensed software, but we try to avoid buying licenses when we just want to evaluate a package. Borrowed software is returned following evaluation and back-up copies are destroyed.

We issue copies, not the original software, to our production users — and we won't license anything we can't copy.

We don't reregister licensed software if it is moved to a different host personal computer or when we swap the original personal computer for repair or upgrade.

These practices clearly do not conform to the requirements of many of the software licenses. Even though our practices are not intrinsically illegal, they could be regarded as being in breach of contract. However, we don't consider that we have damaged the interests of the vendors, so any breach would be merely technical and have no financial value.

Our procedures are based on commercial pragmatism. Because of this, we do sign licenses that we don't intend to adhere to fully. Is this practice ethical?

A breach of contract, no matter how seemingly insignificant the infraction, is unlawful and, therefore, it is unethical.

It's common knowledge

that people in business, government and education have abused personal computer software license agreements — some blatantly. People have openly recounted their abuses to me with a sense of pride of accomplishment. In reprimand for these abuses, some software vendors may have overreacted, in my opinion, in the stipulations and restrictions they set forth in their license agreements. I would be surprised if one out of 100 users even

reads the agreement. Most simply use common sense in their treatment of a vendor's copyright.

The vendor-sponsored campaign to curb abuses is needed, but I agree with you that we need a more pragmatic approach to the licensing of proprietary software. I would encourage the personal computer software industry to cooperate in developing a universal license agreement that is guided by common sense and fairness,

and that can be understood by all and enforced by the industry. As is, a great many users are feeling pretty unethical about now.

Q How do you gracefully say that I will do any work that is remotely related to computers? I have 22 years experience in operations, programming and systems. And I've been unemployed for eight months.

On my resume, I stated

that I am seeking "a challenging position as a programmer/analyst leading to project management." How can I say that I would be happy with any type of computer work without sounding like I'm desperate?

How about this: "a challenging opportunity that will permit me to employ my computer expertise in areas where computing and information resources are not realizing their full potentials."



**OUR NEW 82 SERIES
MULTIPLEXERS
AREN'T MORE THAN YOU NEED
OR LESS THAN YOU WANT.**

Long, president of Long and Associates, is a consultant, lecturer and author in the field of information services. If you have a question you'd like him to address, send it to Larry Long, Editorial Department, Computerworld, P.O. Box 880, Framingham, Mass. 01701.

NEWS

CALENDAR

WEEK OF JUNE 2

JUNE 2-5, DALLAS — American Bankers Association's 1985 National Operations and Automation Conference. Contact: American Bankers Association, Con-

munications Group, 1180 Connecticut Ave. N.W., Washington, D.C. 20036.

JUNE 3-4, BOSTON — Fundamentals of Data Processing for Administrative Assistants and Secretaries. Contact: New York University School of Continuing Education, 575 Madison Ave., New York, N.Y. 10022. Also being held June 30-31 in San Francisco and June 27-28 in Los Angeles.

JUNE 3-5, MONTREAL — Canadian Information

Processing Society Congress '84. Contact: Canadian Information Processing Society, Fifth Floor, 243 College St., Toronto, Ont. M5T 2T1 Canada.

JUNE 3-5, SAN FRANCISCO — Long-Range Information Systems Planning. Contact: American Management Associations, 135 W. 50th St., New York, N.Y. 10030. Also being held June 17-19 in Boston.

JUNE 3-4, CHICAGO — IBM/DB (DL/1) Application

Programming. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 24-27 in Washington, D.C.

JUNE 3-5, CHICAGO — Vams From Start to Finish. Contact: On-Line Software International, Fort Lee Executive Drive, Fort Lee, N.J. 07024. Also being held June 17-20 in Boston and Atlanta and June 24-27 in Los Angeles.

JUNE 3-4, PORT LEE, N.J. — CCB/VB MBO/MC. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 3-4 in Los Angeles, June 17-20 in San Antonio and June 24-27 in Port Lee.

JUNE 3-5, DENVER — Vams Its Structure and How to Use It. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-12 in Port Lee and June 24-27 in San Antonio.

JUNE 3-5, LOS ANGELES — CCB/VB Logic and Debugging. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 17-20 in Port Lee and June 24-27 in Atlanta.

JUNE 3-5, NEW YORK — IBM/DC Programming. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 17-20 in Chicago.

JUNE 3-5, WASHINGTON, D.C. — CCB/VB Applications Design. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 11, 15, 18 and 20 in New York; June 17-20 in Port Lee and Los Angeles; and June 24-27 in San Antonio.

JUNE 3-5, MONTREAL — Montreal International Software Market '84. Contact: Montreal International Software Market, P.O. Box 1119, Suite 1919, 900 La-Peterson, Place du Parc, Montreal, Que. H2W 2M4 Canada.

JUNE 3-7, PORT LEE, N.J. — CCB/VB Internals. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-14 in Atlanta, June 17-21 in San Antonio and June 24-28 in New York, Chicago and Los Angeles.

JUNE 3-7, ATLANTA — CCB/VB Application Programming — Command-Level. Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-14 in Boston, Chicago and Los Angeles and June 24-28 in Port Lee and San Antonio.

JUNE 3-7, MONTREAL — Fourth-Generation Languages Paths to Productivity. Contact: National Seminar, Canadian Information Processing Society, Fifth Floor, 243 College St., Toronto, Ont. M5T 2T1 Canada.

JUNE 3-7, BOSTON — Systems Workshop II. Contact: Ware Associates, P.O. Box 945, Groton, Conn. 06340.

RACAL

VIEWPOINT

Collaboration benefits management, vendors



THE DATA CENTER
John P. Murry

There is a great deal of difference in the way the managements of installations work with their vendors. The styles range from total reliance upon the vendor to complete independence. These cases represent the extremes, and neither is correct.

In the first case, the installation's management has abdicated its responsibility. You can find examples of organizations under the de facto control of their vendors. In these situations, no solution other than the particular vendor's solution is even considered. This is unfortunate, of course, because it precludes all opportunities to find more appropriate, and perhaps less expensive, solutions. Sometimes, as a result of this one-vendor policy, an unnecessarily complex or cumbersome approach is taken to solve technical problems because those are the only answers available from the vendor.

The second instance is also representative of an incorrect position with regard to the vendor-customer relationship. There are information processing managers who absolutely will not rely upon their vendors for anything other than support for whatever specific products they may have installed. The "don't call us, we'll call you" syndrome is in effect here. Sometimes you will see examples of outright hostility toward particular vendors. That is an unfortunate circumstance; it does no one any good.

There is a middle ground. Development of an en-

vironment where the management of the installation and its vendors work together should be encouraged — a collaboration seeking to improve the information processing function. The goal should be the development of a first-class installation, where both the customer and the vendors secure benefits.

The vendor is often in a position to provide significant help beyond the installation and continuing maintenance of its products. The knowledge the vendor acquires as a result of its experience in a variety of situations can be most beneficial.

77

The goal should be the development of a first-class installation, where both the customer and the vendors secure benefits.

where an appropriate rapport has been developed between the vendor and the installation's management. Astute managers should recognize this potential assistance as a positive factor, and they should work to cultivate the proper relationship.

First set the ground rules

The primary step in the development of such a relationship must be in the establishment of the ground rules. The management of the information processing department must not relinquish its authority. The proper role of the vendor is to support actively the needs of the installation within the guidelines set forth by the function's management.

The managers should not only allow but encourage the vendors to suggest new approaches, new products, and those suggestions should receive serious consideration from the customer. It must not

be forgotten, however, that the ultimate goal of the vendor is to increase sales.

Conversely, once an installation's management has rejected a particular item or suggestion, the vendor must acknowledge that the issue is closed and move on to other things. Some vendors do themselves considerable harm because they are unwilling to accept that an issue is closed. Going to a higher level in the organization to plead a case may generate some additional sales, but such a tactic may work against the vendor and create considerable ill will in the long run.

The usual result of such a vendor strategy is the development of an adversary relationship with the installation's management. This contributes to an attitude that works to erode the vendor from increased participation — and eventual increased sales — within the organization.

Both customer and vendor should be aware of the value of ancillary services the vendor can provide. This can often be provided with little or no cost to the customer. This aspect of dealing with the vendors should be considered a value-added feature. Vendors should work harder to push this concept because it is of value to all concerned. Making the management of the particular installation more effective without increased cost will often generate increased sales for the vendor in the future.

Applying value-added features

What are some of the specific areas where help can be provided? Several concerns within the data center can be used as examples. Many data centers face difficulty in dealing with client calls, with their scheduling processes and with client relationships. As a result of their numerous contacts, vendors are often aware of data centers where these concerns are being effectively managed.

The vendors may be in a position to help a lot of people in other organizations who can provide help. They may also be able to provide members of

See DATA, page 38

Murry is director of management information services for Raytheon Corp., Medford, Wis., and author of Management Information Systems as a Corporate Resource, published by Dow Jones-Irwin.

A 'we'll see' approach can placate cries for new 'toys'



MANAGEMENT
DATA CENTER
Vickie F. Cate

Let's suppose that you are handling DP for one of several divisions within a big corporation. You get a call one day from the vice-president, asking you to "come over for some coffee and a chat." The next day, there you are with your boss and maybe one or two people from other areas for a little coffee and a chat about, as it turns out, shiny new toys.

The vice-president just returned from a tour of another division and is bursting with new ideas — some of which involve you. "They have this great new XYZ system they just finished, and the vice-president over there tells me it shouldn't be too much trouble to implement here. It ought to be a big help to you in finishing up that ABC system of ours. What do you think?"

Forget the report you did last week describing ABC as 65% com-

plete. Stay calm. Remember what you were told as a kid when you absolutely had to have a shiny new toy just like the other kids. Don't say so; say, "We'll see."

There must be a reason why the powers that be want this thing. There must be a reason, whether or not it's a good one. This means you really do have to take a good look at this new toy. If you decide not to adopt the system, you'll need solid reasons for the front office. If you do decide to adopt it, the reasons must be even more solid for the folks in the programming pit. (They do get a little possessive about their creations.)

Time is a problem

Your problem is one of time. Ordinarily, you would want to work up a point-by-point comparison of the existing and proposed systems: strengths, weaknesses, costs and savings.

This lets everyone involved make an objective choice. But the kids in the front office are no doubt eager to get your answer; you don't have the time to do that. Tell study, and the odds are you don't have the budget to support it either. The trick is to do just enough of an analysis to let the folks in the front office decide whether or not they want to fund your department for a full study.

Don't consider this just another batch of busywork — look at it as an opportunity to close a sale.

You're selling that full study, and the nice thing is you win no matter what. If they buy the study, you have the time and money to do a proper analysis of the new XYZ vs. your existing ABC. On the other hand, your presentation tells them that abandoning ABC for XYZ is just too expensive. You won't have wasted time on an unfunded study, and you wind up no worse off than you were before.

Recognize that the attraction of this new toy is likely to be more in how well it performs what it promises. Your presentation should reflect that attitude, comparing features and the costs. To do that, you can successfully use some of the techniques used to close a sale.

Add up the features

One technique that fits the situation and takes a little time is called the "T-Chart." Draw a large "T" on a piece of paper, dividing it into two columns. Label one side "XYZ," and put down its notable features, starting with the ones that seem to be the most attractive. Then label the other column "ABC," and opposite

each of those desired features put down the nearest equivalent feature of ABC. If your ABC system doesn't have it, put down the name of your in-house package that does. You should be able to sketch this out fairly rapidly in a brief talk with the people who want the new system. You can then use it with a telephone call to the DP manager who wants the other system. Finish by extending the ABC column, if necessary, with those features it has that XYZ doesn't.

You'll see two things from the customer's list of current in-house systems that have the desired features and a set of those features that you do have that the XYZ system doesn't provide. It's almost certain that the desired features can't be carried over directly, but because you have identified the nearest equivalent, you can find a reasonable estimate of the cost to produce that feature by looking in your files. If you completely adopt the new system, you will have to rework it to add those features or you'll lose them. That's an expense.

You'll end up with three numbers: the cost to abandon ABC and adopt XYZ, the cost to modify ABC to pick up the most attractive features of XYZ and the cost to adopt XYZ. See DATA, page 38

Cate is a senior associate with National Defense Association in Bryn Mawr, Pa.

DATA BASE FAT.

**HOW TO AVOID IT, FROM THE LEADER
IN ON-LINE TRANSACTION PROCESSING.**

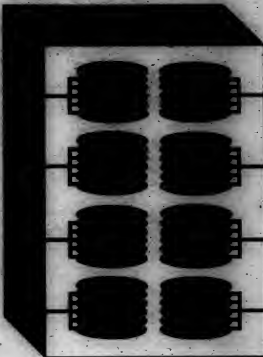
WHAT DATA BASE FAT IS

It's a waste of time and space—the time it takes to access data and the space required for the storage. It's a hardware problem and a software problem and Tandem has solved them both.

NEW NON-FAT HARDWARE

Introducing a new disc drive product called the Tandem V8.

The data base that would normally be stored on one large, conventional disc has been split up over eight small, high-density discs.



NEW TANDEM V8.

8 disc drives, 8 actuators in one cabinet.

Instead of one actuator handling I/O requests sequentially, eight actuators can now work simultaneously. No disc space goes unused.

The Tandem V8 gives you high throughput, stores 1.3 gigabytes of data, yet remarkably takes up only six square feet of floor space.

Maintenance is easy, too. Each disc drive can be removed and replaced in a few minutes. And the Tandem V8 can stay on line even while it's being serviced.

NEW NON-FAT SOFTWARE

We've developed new data base software that allows our relational data base to operate 50% to 100% faster on the same hardware. That means you can boost your throughput without buying new hardware. Massive amounts of data can be made easily and instantly available to hundreds of users, even if they're geographically distributed over a worldwide network.



TANDEM'S GROWTH ARCHITECTURE

When you outgrow a Tandem system, you don't replace it. You just add to it. You can start with two processors in a local system and expand at any increment you choose, all the way to 4,080 processors worldwide. You never buy more than you need.



Tandem matches need. The competition outgrows it.

With Tandem, your software expands, too. So you only write applications once. It's also a fault-tolerant system that stays on line without using idle backup components. Instead, each component has at least one identical copy with which it shares the workload. No single failure can shut you down.

LET'S CHEW THE FAT

Tandem systems are already at work for FORTUNE 500 companies in banking, telecommunications, manufacturing, transportation, retailing and energy, as well as several branches of the U.S. Government.

To find out what we can do for you, call (800) 482-6336. Or write for our annual report. Corporate Headquarters: 19191 Vallico Parkway, Dept. 762, Cupertino, California 95014.

TANDEM COMPUTERS

VIEWPOINT

IBM 3270 no substitute for 5250 on System/36, 38



**READER'S
PLATFORM**
Charles S. Bailey

The proliferation of IBM products based on the 3270 technology has been the subject of much attention, particularly in the article, "Evolution of the IBM 3270" (CW, Jan. 21), where author Scott Bresser presented a number of comments and reflections on the subject. I am in agreement with most of those comments, but there is one area in which my opinions differ — namely, the possibility that IBM will standardize the 3270 as a replacement for the 5250 series supported on the IBM System/36 and 38.

This projection was based on the release of remote 3270 support on the System/38, as well as on the fact that a version of the 3180 terminal is supported locally on both the System/36 and 38. On the surface, these two facts would tend to support the anticipation of 3270 standardization. However, detailed examination of these facts may lead one to an entirely different set of conclusions.

Although the 3270 and 5250 terminal series appear to be functionally similar, the 5250 series has a number of features designed to relieve the host or remote cluster controller of many of the processing functions required in the 3270 series. The 5250 series — 5251, 5251, 5252 and 3180 Model 2 have 32 different combinations of display attributes supported on a standard basis. The local editing features include independent processing of zero fill, right/left adjust, auto field exit and alphanumeric field-only check.

Resident logic

A key point is that the logic to support these features is resident in the terminal itself, rather than in the controller or the host applications program as in the 3270 series.

It is true that IBM has released support of remote 3270 clusters on the System/36, but I suspect that this feature was announced to assist migration of small networks — for small 4350 series customers who have chosen to move to the System/38 environment — rather than as an indication of the 3270 becoming the primary terminal for this system.

The support of 3270 devices on the System/36 re-

quires large memory commitments (60K-byte base plus 20K-byte/device) and significant system overhead to allow the 3270 to emulate the functions of the 5250 keystrokes. If IBM had intended to position the 3270 as its replacement for the 5250 on the System/38, one would have suspected IBM to have taken a more integrated ap-

proach to 3270 support.

IBM further supports evidence of my position by its introduction of the 5294 remote cluster as a replacement for the 5251 Model 12 remote cluster. The 5294 has enhanced processing capabilities that can be modified by microcode changes. The new unit can support speeds up to 56K bit/sec. The unit has

vastly increased local storage, which reduces the amount of data traffic between the host and the cluster significantly by providing local screen save and restore capabilities.

Several clues to IBM's future directions in these areas were provided recently by IBM's comprehensive announcement of its Office

Automation Strategy. The 5294 has been enhanced by the addition of a text editing assist feature to work with the new Display write series announced on the System/36 and indicated as a future product for the System/38 in an IBM statement of direction.

The second point raised by See 3270 page 30



Bailey is president of Perle GSD, Ltd., a Chicago-based supplier of protocol conversion equipment for the IBM System/34, 36 and 38.

LETTER *See page 34*

performance in program productivity while using structured coding. This is because no attention was given to improving the ability to understand Cobol coding. Installations that have shown some increases in productivity included "walk-throughs." These walk-throughs encourage programmers to make their coding more understandable in anticipation of the walk-through session. It is this

coding clarity, combined with the structured coding, that is making the difference.

We in data processing must not forget that programming productivity — through clearly understandable, easily maintainable coding — was the major objective of the creators of Cobol. All we need to do is use Cobol as they intended.

A key tool to achieving understandable coding is the automated Cobol quality as-

sessment monitor. It monitors Cobol coding and alerts programmers and management to deviations from company standards. It also includes a metrics portion that identifies the quality of software and applications programs.

Data processing can dramatically increase program productivity *only* if recognition that understandable coding is the correct path and then follows that route.

Jerry Silver
New York

DEAL *See page 38*

their own staffs who can suggest methods that have worked well for other installations. Rather than continue to struggle with such issues, the help of the vendors should be solicited.

The vendors can, as much or more, provide hints of other installations for similar management who desire increased information about a new process or system before they agree to provide sup-

port for its installation. To some degree, of course, this is a sales play, but it can also provide an opportunity to demonstrate how the process or system will work in the organization. It also gives senior management the opportunity to look objectively at the values of the proposal.

A balance must be struck between turning over control of the information processing function to the vendors and ignoring the potential inherent in their increased participation. If the value of that participation is understood and appreciated, if management wants to develop the appropriate environment and if the proper balance is maintained, everyone in the installation wins.

MATRIX *See page 38*

modify it to pick up the most attractive features of ABC. Obviously, you can't guarantee that the work can be done for those costs — the numbers are too rough as yet. On the other hand, you can justify each of the numbers as reasonable, even if rough, because they come from previous projects rather than off the top of your head.

No one can say you haven't been objective. But of all, you've offered options to the front office and put the ball back in their court. Now they, not you, have to decide whether to give you the additional time and money to do your full proposal or to abandon the idea altogether.

It's quick and dirty, but it works. When you were a kid, "we'll see" didn't always mean "no." When it didn't, the next question was, "What's it worth to you?"

3270 *See page 38*

It was that the 3180 was supported on the System/36 and 38, as well as 3270 subsystems. While the 3180 Model 2 (a member of the 6360 series) shows keyboard, display and logic units with the 3270-compatible 3180 Model 1, the 3280-compatible 3180 Model 3 uses more complex microcode and a twin-axial interface, rather than the coaxial type A interface on the 3270 series. As IBM is sharing many component subsystems, logic units and enclosures in its various implementations of the Personal Computer to achieve manufacturing efficiencies, it would follow that a similar strategy in the terminal area would be followed without losing the ability to offer products that differ vastly.

A user who has committed corporate resources to the acquisition of 6360 series terminal equipment should be reassured that this investment will not soon be obsolete.

WHAT WE BELIEVE:

AS THE MOST BROADLY EXPERIENCED SOFTWARE VENDOR IN THE WORLD,
WE, COMPUTER ASSOCIATES, BELIEVE THAT OUR SYSTEMS EXPERTISE IS WHAT
MAKES OUR FINANCIAL MANAGEMENT SOFTWARE PRODUCTS THE
SUPERIOR SOLUTIONS TO ALL FINANCIAL SOFTWARE NEEDS.

**COMPUTER ASSOCIATES
FINANCIAL MANAGEMENT SOFTWARE.
POWERFUL, NEW INTEGRATED ONLINE
SOLUTIONS THAT MAKE YOUR FINANCIAL
PEOPLE MORE EFFICIENT, MORE PRODUCTIVE,
AND MORE SATISFIED.**



COMPUTER ASSOCIATES

SOFTWARE & SERVICES

SOFTWARE/WILLIAM NACON

Impact of standard work unit

First in a two-part series dealing with the concept of the standard work unit measurement and its impact on on-line systems performance.

The foundation of efficient on-line system performance is a concept known as the standard work unit. The standard work unit was initially born of experiences with on-line systems at McDonnell Douglas Automation Co. (McAtee) in St. Louis in the

James is a director at Coopers & Lybrand in Denver, a noted author on the subject of data base design and a regular contributor to Software.

late 1960s and early 1970s. From its origin at McAtee, the standard work unit has spread to other on-line environments where there is a desire to have consistent, satisfactory on-line performance.

Once management goes beyond simply adding hardware to improve performance, it will discover that the long-term solution to better on-line performance is to control on-line systems from the moment of their design, ensuring that all on-line transactions conform to the standard work unit.

The standard work unit applies wherever there is an on-line system that has transaction and data integrity.

See SWFT page 45

Codd: Relational approach to DBMS embraced by users

By Susan McInerney
On Staff

CINCINNATI — Although somewhat hesitant about self-praise, E. F. Codd, founder of the relational data base model, said he expects his relational approach to data base management to be a lasting one. "The relational approach is going to be around for a long time," Codd told attendees at Cincom Systems, Inc.'s annual user group meeting held here recently.

In explaining the concepts of his relational data base model, Codd said he believes relational systems have been widely embraced by users because they allow data to be easily distributed, give end users a wider variety of data views and provide a flexible authorization system for data base administrators.

Codd said he was driven to develop the relational model after examining the data base management systems of the 1960s. "I

See COWR page 30



SOFTWARE
MARC MCINERNEY
ON STAFF

Cincom sports new look to aim for top

For Cincom Systems, Inc., the recent Interact '85 event was more like a coming-out party than a users group meeting.

Once a modest company that enjoyed the success of its Total data base management system (DBMS), Cincom is hoping to take on the giants of the software industry by first taking on a new look. Cincom is sporting a new president, a new package of products and a new emphasis on marketing that it hopes will catapult it from a \$100 million a year company to a \$500 million a year company by 1990.

Last year Cincom restructured its management team, putting Dennis Yablonsky, formerly Cincom's director of marketing and sales, into the president's office and moving Thomas Niss, the firm's founder and former president, into the chief executive officer post. Management directions at Cincom will not differ greatly from those present course, said Yablonsky, who told Computerworld that he shares the business philosophy of his predecessor.

However, the current emphasis on marketing comes through loud and clear. Yablonsky is a dynamic, outgoing executive with an extensive sales background. Four of his six current vice-presidents have some responsibilities within the marketing or sales areas and, in a year and a half, the sales team has more than doubled to nearly 200 sales representatives, he said.

Cincom's management team is giving increased attention to its integrated products, including its TDS DBMS-related products, widely installed Mantix fourth-generation language, tools for data base administration, applications software, a micro-mainframe connection and a net-

See COWR page 50

■ Garnett New Media Services unwrapped an on-line news summary service — based on the USA Today newspaper — accessible via micro or terminal/43

■ Data Kinetics released an automatic table handling system for IBM mainframes/43

■ Data Design Associates introduced an interactive query facility for its IBM-based financial applications/43

■ Ecca announced a micro-based decision support system and a link that allows for the transfer of mainframe data to the DSS/43

INSIDE
Systems
Software/48
Productivity Aids/48

TPX Increases Productivity For Terminal/Network Users

Terminal Productivity Executive (TPX) supports concurrent access to unlimited application sessions in MVS and MVS/XA environments—at the touch of a finger.



- Session Switching—allows users to easily switch in and out of any number of online applications
- Help Desk Assistance—users can send their screen to another terminal for help in troubleshooting
- Automated Conversation Language (ACL)—allows preprogrammed conversations to take place between the terminal and any application, such as a login/logout



DUCKWORTH SYSTEMS INC.
Two Allegheny Center
Pittsburgh, PA 15212
(412) 323-3600 inside PA
800 323-3600

SOFTWARE & SERVICES

Tablebase released in U.S. for use with IBM mainframes

OTTAWA — Data Kinetics Ltd. has announced the U.S. release of Tablebase, an automatic table-handling system for IBM mainframes.

A spokesman said the product is designed for use with either IBM's MVS or DOS operating systems and automates the management of data in virtual memory.

Tablebase provides table searching and data reorganization capabilities and increases users' control of applications systems, according to the vendor.

Tablebase reportedly reduces processing time, system maintenance and coding requirements.

It allows users to take better advantage of current IBM hardware architecture and core memory facilities, including Extended Architecture, and allows flexible restructuring of data in core memory, the spokesman said.

Tablebase supports several teleprocessing interfaces, including IBM's BPF, IBM/DC, CICS and others.

Tablebase is priced at \$25,000 for MVS and \$15,000 for DOS.

More information about Tablebase is available from Data Kinetics, located at 97 Huron St., Ottawa, Ont., Canada K1S 3K5.

Data Design introduces interactive query facility

SUNNYVALE, Calif. — Data Design Associates has introduced an interactive query facility for its applications software packages for IBM mainframes under OS and DOS. The company also announced an interface to IBM Personal Computers.

According to a spokesman, DD-View is said to eliminate the need for a report writer by allowing users to create on-line queries. Query definitions created by users can be saved. As definitions are created, selected formats are displayed at the bottom of the screen. When users select an erroneous definition, the system dis-

plays an error message and the cursor is displayed in the field needing correction.

The company's DD-Link allows Personal Computers and terminals to emulate mainframe terminals. With DD-Link, mainframe data is reformatted for compatibility with spreadsheet programs for Personal Computers. Both DD-Link and DD-View are integrated with Data Design's mainframe applications.

DD-Link costs \$10,000. DD-View is available with Data Design's applications packages, which cost between \$21,000 and \$68,000 depending on the modules selected.

Data Design is located at 1278 Oakwood Pkwy., Sunnyvale, Calif. 94086.

SYSTEM 2000 DBMS

**The Only Full-Function
DBMS for Your
Information Center
from the Leader
in Information
Center Software**

**SAS Institute Inc.
First-year Price: \$12,000
Call today for a free trial.**



**SAS Institute Inc.
SAS Circle, Box 8000
Cary, NC 27511-8000
Telephone (919) 467-8000 X280**

SYSTEM 2000 is the registered trademark of SAS Institute Inc. Copyright © 1985 by SAS Institute Inc. Printed in the USA.

Gannett offers on-line news

WASHINGTON, D.C. — Gannett New Media Services, a division of Gannett Co. and publisher of the USA Today newspaper, has announced USA Today Update, an on-line news summary available through three information networks.

A spokesman said USA Today Update summarizes news from some 200 national and trade news sources including wire services, major metropolitan newspapers and broadcast outlets.

The summaries are targeted to specific businesses and industries. The news summaries, dubbed Decisionlines, are typically 20-paragraph capsules of developments in industries such as banking, insurance, law, energy, travel, telecommunications, technology and real estate. Updated Decisionlines are available at 9 a.m. EST each business day.

Offer more in-depth look

In addition, USA Today Update's hotlines summaries offer headlines of general, financial, weather and international news from 8 a.m. to 11 p.m. EST. The service's Special Report summaries, which are provided in question-and-answer format, offer a more in-depth look at topics of interest.

USA Today Update is prepared by a staff of journalists based in Arlington, Va. The service can be accessed via terminal or microcomputer over dial-up lines through information networks including General Electric Information Services Co. (Gelsco), H & H Block Co.'s Compuserve and Newman, Inc.'s Newsnet.

As an example of pricing for USA Today Update, rates from Gelsco, which are discounted based on usage, begin at \$40/hour for corporate users. With a 10-hour monthly minimum, the rates are \$56/hour; 20-hour monthly minimum, \$32/hour; 50-hour monthly minimum, \$30/hour; and 100-hour monthly minimum, \$26/hour, a Gannett spokesman said.

Gannett New Media Services is located at P.O. Box 450, Washington, D.C. 20044.

SOFTWARE & SERVICES

Esca offers IBM-based DSS, link

CHICAGO — Esca, Inc. has introduced an IBM Personal Computer-based decision support system (DSS) and a micro-mainframe link that allows users to transfer data from an IBM mainframe to this DSS.

A vendor spokesman said Esca Mainframe Link (MFL) permits users of its Esca-DSS to retrieve data from a mainframe data base without using data programming terms. Esca MFL runs as an IBM CICS application that transmits selected data from IBM's MVS operating system data files to the micro.

Users must be authorized to log on to CICS and enter the correct password in order to begin a session, the spokesman said. A user data view capability "blows" data elements available to the user to be sent back to the micro. Esca MFL incorporates a data dictionary that keeps a list of DSS users and the data bases they can access.

Esca MFL costs \$40,000. It is currently being beta tested and will be available in the fourth quarter.

Esca-DSS is a menu-driven program said to provide business analytics functions without the use of a command language. The spokesman said users can retrieve data, draw graphs, perform statistical functions or view results by using a mouse or cursor keys. Users can simultaneously gather information and analyze it in different ways. A modeling function handles multiple dimensions without the need to rebuild the product's spreadsheet when data is added.

Esca-DSS costs \$2,000 per copy and will be available in the fourth quarter.

Esca is located at Suite 650, 312 W. Randolph St., Chicago, Ill. 60606.

SYSTEMS SOFTWARE

Media Frame Software Products Corp. has announced Screens, a utility that allows users to create and maintain screens in an IBM IMS/DC environment.

A vendor spokesman said Screens can bypass IBM's MPS facility. Memory is saved because the MPS buffer pool is no longer required. Screens does not access IMS libraries to format information to be displayed or read, thus allowing the number of inputs and outputs for each transaction to be lowered. A "hard-linking" facility can be used to eliminate inputs and outputs to the data base.

The product includes an applications windowing facility that lets end users design screens. Default capabilities allow the user to create or change screens from an IBM terminal while IMS is active. Screens can be developed under IBM's TSO and migrated to IMS.

A permanent site license for Screens is \$10,000.
Media Frame Software Products,
155 Glen Road, Wellesley, Mass.
02151.

See SOFTWARE page 44

Honeywell unveils tools for DPS line

Adds info retrieval, graphics packages

PHOENIX — Honeywell, Inc. has announced Textis, an interactive document management and information retrieval system, and the Business Graphics Option module for the Honeywell Financial and Corporate Planning System (HFCS). Both products run on the company's DPS 8, DPS 86 and DPS 80 mainframes under the Gase 8 operating system.

Textis, developed by Chromata, S.A., is a productivity tool for the organization, storage and retrieval of textual data, a spokesman said. The

product allows users to create a document data base, then cross-reference the stored documents through user-defined keywords. The user builds a library of documents, catalogs or index files by entering information on blank forms supplied by Textis. The system then creates firm letters, mailing labels, sorted and formatted lists or user-defined reports.

Chromata's Legatol option was announced as a command language for Textis to provide a simplified user interface to the Textis data base. Legatol is said to enable the end user unfamiliar with Textis commands or applications to enter requests for information. The Legatol option also permits the user to list and save a set

of commands for routine procedures.

The Textis document management system is available now for \$25,000. The license fee for Legatol is \$15,000.

The HFCS analysis data and provides a base an organization can use to build interactive analysis models, according to the vendor. The Business Graphics Option translates HFCS models into full-color histograms, pie charts, bubble plots and line and star charts.

HFCS is available for a license fee of \$3,700. The HFCS Business Graphics Option is available for a license fee of \$12,440.

Honeywell can be reached at P.O. Box 8000/A-79, Phoenix, Ariz. 85066.

XPEDITER™

Can Reduce IBM COBOL
Testing and Debugging
By 30-50% Or More...
Improve Schedules...
Boost Programmer
Morale!

XPEDITER offers more integration,
convenience and proven
performance than XPF/COBOL.

COMPARE
BENEFITS

• **Maximum Productivity** - XPEDITER runs in MVS, VM/CMS, and online with IMS for both your COBOL and Assembler programs...

• **Maximum Compatibility** - XPEDITER supports popular software such as CA-OPTIMIZER™, PANEXEC™, The LIBRARIAN™, ISPF™, BTS™, and HOGAN™...

• **Minimize Your Compile** - No changes to your COBOL source, object, or load modules...

• **Minimize Your Overhead** - XPEDITER requires less interactive overhead. There is also an option for batch mode... compressed symbolics and no required retention of compile listings.

For More Information
Call or Write Today

1-800-358-3048
In Minnesota 612-560-8633



IBM COBOL is a product of International Business Machines Corporation. CA-OPTIMIZER is a product of Computer Associates. PANEXEC is a product of Panagor. The LIBRARIAN is a product of IBM. ISPF and HOGAN are products of International Business Machines Corporation. VM/CMS is a product of IBM.

SOFTWARE & SERVICES

SOFTWARE

from page 43

Applications Software, Inc. (ASI) has introduced a version of its **ASL/Inquiry**, software that supports downloading of data to the IBM Personal Computer from microcomputers running IBM's IBM/PC or CISC. **ASL/Inquiry** reportedly incorporates an architecture based on real-time query of IBM's DB/1 data base management system and supports downloading to each personal computer software as Lotus Development Corp.'s 1-2-3 and Ashton-Tate's Dbase III.

The software also offers an ability to do ad hoc code generation and an internal clock that prioritizes system resource allocation.

ASL/Inquiry costs \$72,000.

ASI, 5455 Gardens Grove Blvd., Westminster, Calif. 92683.

Software Research Associates has announced that its **Test Coverage Analysis Tool (Tcat)** software now supports the C language.

According to a spokesman, versions of the **Tcat/C** system are available for Digital Equipment Corp. VAX series minicomputers under the VMS or AT&T Unix operating systems and for IBM Personal Computers under PC-DOS.

The product consists of a C "instrumenter," a runtime program that collects test coverage data and writes trace files, and a coverage analyzer that produces coverage numbers. Also included are an interactive runtime package, utilities for manipulation of trace files, a trace file archiving facility and on-line help screens.

Tcat/C costs \$2,600 for a single CPU perpetual license, \$8,000 for a multiple CPU site license and \$975

for a single-user micro license.

Software Research Associates, 620 Market St., San Francisco, Calif. 94104.

Advarco, Inc. has announced the **Resource Account Management and Statistical Exception System (Rames)** job accounting and resource management system for IBM's System/36 minicomputer.

Written in RPL-III, the program is said to track and provide exception and summary reports on devices in the system, including CMTs and printers. The system's financial management charge-back capabilities provide job accounting and resource usage monitoring.

Rames costs \$2,995.

Advarco, P.O. Box 263, Shrewsbury, Mass. 01545.

Uccel Corp. has announced **Release 1.2** of its **Automated System for scheduling batch job restarts and reruns**. **UCC-11** runs on IBM or compatible equipment under OS operating systems.

Release 1.2 reportedly uses dynamic allocation for performance maintenance on the system's two data bases. In addition, the enhanced **UCC-11** is said to expand several on-line functions, simplify installation and revision documentation.

Release 1.2 includes tools to evaluate the impact a restart/rerun may have on subsequent jobs. The features are said to help identify potential problems and to increase the efficiency of recovery.

The one-time license fee for **UCC-11** is \$21,000.

Uccel, Uccel Tower, Exchange Park, Dallas, Texas 75225.

Exsys, Inc. has announced that its expert system for software development is available for the Data General Corp. **Eclipse** MV series of mini- and superminicomputers under the AOB/78 operating system.

Exsys is written in C language and was developed in New Zealand by Adina Software Ltd. The expert system is said to cut program development time by allowing systems analysts to design applications by defining them, with no programming or testing required. Documentation is provided automatically by **Exsys**.

All **Exsys** programs are integrated with the name file structures, data relationships and cross-referencing of data and procedures, a spokesman said.

Exsys is a member of DG's Independent Software Vendor program. The product was developed with research money provided by DG.

Prices for **Exsys** range from \$20,000 on the MV/4000 to \$125,000 on the MV/10000.

Exsys, Tower 56, 186 56th St., New York, N.Y. 10022.

Productivity Products, Inc. has announced **Focus** and **Focus** for enabling users of Information Builders, Inc.'s **Focus** fourth-generation querying and retrieval tool to generate file descriptions from the IBM DB/DC Data Dictionary.

Focus and **Focus** focus users in the IBM MVS and VM/CMS environments.

According to a spokesman, **Focus** creates **Focus** file descriptions for operating systems' flat files, IMS data bases, CMS files and Information Builders' **PC/Focus** files.

The **Focus** programs enables users to fill the data dictionary with information on their current systems.

The price for **Focus** and **Focus** is \$15,000; **Focus** alone is \$10,000.

Productivity Products, P.O. Box 36, Vernon Hills, Ill. 60061.

P-Stat, Inc. has announced that its **P-Stat 8** data management and analysis software is now available for the Control Data Corp. **Cyber 180** minicomputer.

P-Stat 8 combines interactive data and file management, data display, statistical analysis and report writing capabilities in a single package, a spokesman said. The package features on-line help, interactive data

Continued on page 48

Sterling Software produces the best DASD Management System in the world

... and we can prove it.

DMSOS™ the DASD Management System from Sterling Software Marketing, has consistently been rated highest for overall user satisfaction in leading independent surveys. **DMSOS** users—worldwide—trust our product to manage approximately 489,935 volumes of data a day.

15,309,000,000 bytes of data daily...

That's a lot of user confidence, and here is why.

DMSOS — The First \$25 Million Seller in DASD Management

In 1984, **DMSOS** became the first system software package for data management to top a total \$25 million in sales.

1,600 users give their reasons for choosing **DMSOS**

- Easy to install — Easy to use
- Keep more data on-line, using less space
- On-line reporting for fast decisions
- Dramatically reduces backup and recovery time
- Supports all standard data set organizations
- Fast data accessibility, regardless of medium
- Adaptability to new hardware/software systems
- Automates migration to 3380's
- Reduces personnel costs

We Listen To Our Users

When **DMSOS** users tell us about their data management needs, we listen—and respond with solutions that fit those requirements. When you call for technical assistance, implementation advice—or any question at all—you are talking to a key member of the **DMSOS** development team.

No matter what hardware or software changes occur in your operating environment, **DMSOS** keeps pace... continuing to evolve... always state of the art.

Let Us Prove It To You...

With A FREE 30-Day Evaluation

Sterling Software Marketing offers a free **DMSOS** evaluation. We'll show you why we are the proven leader... You have nothing to lose, and everything to gain in DASD space.

For your FREE **DMSOS** evaluation call today
800-824-8512. In California, Alaska, Hawaii, and
Canada call collect 916-635-5533.

**STERLING
SOFTWARE
MARKETING**
1800 White Rock Road, Suite 100
Rancho Conejo, CA 93070-6090

DMSOS is a trademark of Sterling Software, Inc.



"VAX IS GIVING AMF MORE TIME FOR THE THINGS THAT REALLY MATTER."



Michael Lilly
Director, Corporate MIS Operations
AMF Incorporated

To many people AMF means recreational sports. But today it also means electronic components, filtration equipment, automated process equipment and more.

It's a vastly more complex company. A company made

vastly more manageable by Digital's VAX™ computers – the vital component of office automation at AMF Corporate/MIS Operations.

As Michael Lilly says, the company's decision to stake its future in MIS on Digital's VAX computers – and the office automation tools like AI-In-1™, DECnet™ and DECmail™ software that run on them – was hardly a snap judgment.

Every major computer company was considered. Lilly says that, "dollar for dollar," only Digital's VAX system offered the power, ease of use and communications capability with other computer systems – including IBM – that AMF needed.

So AMF chose the VAX com-

puter – the best-selling 32-bit computer in the world – and waited to see what the machine could do.

**"SUDDENLY
WE HAVE TOOLS AND
CAPABILITIES WE
NEVER HAD BEFORE."**

Lilly and his group didn't have to wait long. The system was up and running within days.

Reaction within the department was rapid and gratifying. "We really got excited about it," says Lilly. "Immediately, we were communicating better." And there was more – spreadsheets and word processing and a mail system. "Suddenly," Lilly said, "we had a vehicle for total open communications to every impor-

tant person or department in the corporation."

Part of the story behind AMF's almost instantaneous rapport with the VAX system is that it's so easy to use. Menus and operating commands are the same for each fully integrated application. Whole functions are completed in as few as two key-strokes. And because everything is in plain English, it's literally as simple as A-B-C to incorporate



any VMS™ application into the daily work routine.

**"INSTEAD OF SIX
HOURS TO DEVELOP
AN APPLICATION,
IT TAKES TWO."**

VMS software development tools have so improved the way things are done in his department, Lilly says, that he projects the savings in applications development time and costs alone at some 70 percent.

"Many of our new applications here at AMF will be written on that machine. I can't quantify it exactly. All I know is that I'm getting a heck of a lot more bang for my buck."

The first tests of VAX equipment proved so successful, that AMF quickly enlarged the system, adding terminals and DECmate™ and Rainbow™ personal computers. New departments went on line, for example finance.

"And that," says Lilly, "really created an explosion." Now AMF is implementing programs like general ledger systems, stock options and inventory sys-

tems, and keeping more efficient and flexible records, from accounts payable to personnel.

Adds Lilly, "People here are screaming to be on the VAX system, and there's got to be a reason for that. And I tend to think that it's return on invest-

department to the forefront.

"It's put corporate MIS on the map," he says. "It has effectively increased productivity and efficiency. People are beginning to believe we can do the things we say we are going to do."

And what VAX technology



ment, mailing lists, discounted cash flows, spreadsheets they couldn't even begin to do before, versatility, tremendous graphics potential. It's just a whole world of opportunity that is elevating AMF to the forefront."

**"ANYONE WHO
USES VAX IS GOING
TO GET THE
COMPETITIVE EDGE."**

Lilly feels the VAX system has already elevated his own

is doing for his group, Lilly believes, it can do for all of AMF, or indeed for any company. "Any corporation that employs this technology," he says, "is going to get the competitive edge."

"This technology will explode. Because there are a thousand reasons to have it. But what it really all boils down to is this: everybody will want a VAX system because they can do the job better, faster and more efficiently.

"And that's what really matters."

**BEST MANAGED
SYSTEMS
IN A CLASS.**

VAX office automation computer systems, like all Digital hardware and software products, are engineered to conform to an overall computing strategy. This means our systems are engineered to work together easily and expand inexpensively. Only Digital provides you with a single, integrated computing strategy direct from desktop to data center.

To learn more about Digital's VAX system, call toll free: 1-800-DIGITAL, ext. 200, or write Digital Equipment Corporation, 200 Baker Avenue, West Concord, MA 01742.

**THE BEST MANAGED
COMPUTERS
IN THE WORLD.**

digital

SOFTWARE & SERVICES

Continued from page 46

entry, relational data base capabilities and an English-like command language.

According to the vendor, P-Stat 8 is available on all models within the Cyber 180 line including the CDC Cyber supermain, Models 810 and 830.

The prices for P-Stat 8 range from \$18,000 for Model 810 to \$18,000 for Model 830.

P-Stat, P.O. Box 411, Princeton, N.J. 08542.

PRODUCTIVITY AIDS

IBM Software Co. has introduced a CICS application development system for IBM mainframes running MVS.

Qwik/CICS enables end users to create and modify program selection menus, help text, transaction error message text and network broadcast messages, a spokesman said. It automati-

cally generates CICS command-level Cobol source statements.

Qwik/CICS contains a field-level security feature and reportedly is available with an interface to higher level security software, including Cambridge Systems Group, Inc.'s ACT2 and IBM's RACF.

A license for Qwik/CICS costs \$29,000.

OBS Software, 115 Sansome St., San Francisco, Calif. 94104.

Dugan Systems, Inc. has announced Release 6.0 of its filtered Dataset Integrity Plus (DIP Plus) productivity aid for data management. The product runs under IBM VSI, MVS and MVS/ZA environments.

Release 6.0 reportedly eliminates data integrity and protection problems caused by simultaneous access of the same data, according to a spokesman.

The product reportedly offers enhanced job require-

ments when no Daid is available and is said to exploit the faster I/O available on IBM 3090 and the recently announced 3090 series processor.

Other enhancements to Release 6.0 include a conflict display feature that displays information about local and cross-systems problems and a hardware reserve display that aids in diagnosing server interface.

For a two-CPU shop, the permanent license fee for DIP Plus is \$14,500; a permanent license for shops with an unlimited number of CPUs is \$19,000.

Dugan Systems, Two Allegheny Center, Pittsburgh, Pa. 15212.

PCI introduces remote IBM PC to IBM host access with auto callback security.

You're looking at the best way yet to get dial-up PC/XT/AT communications with your IBM mainframe, or System 34/36/38.

Introducing PCI's new Series 200 protocol converters for 3270 or 5250 emulation—with built-in auto callback security.

Password. Auto callback. Specific device routing. Auto login/logout.

Our new Series 200 actually gives you four levels of control for local or dial-up access:

Password security lets you create and store up to 32 individual passwords. And profiles.

Auto callback disconnects selected users. And calls them back at pre-established locations.

Specific device routing automatically moves the valid user to a predetermined LU.

Auto login/logout provides automatic login for a pre-authorized application. And assures clean logoff if the dial-up link is disconnected.

More security from PCI. Over 9,000 installations worldwide.

PCI leadership gives you extra assurance, too—with over 9,000 installations now in service.

Check all the features of PCI's new Series 200, including our PCI-276 for IBM 3270 SNA/SDLC, PCI-271 for IBM 3270 Bismarck, and PCI-251 for IBM System 34/36/38 environments.

For complete information, contact PCI today.

1 (800) 423-5904.
In Calif., (415) 714-5500.
Telex: 715312

Making the non-IBM world IBM compatible.

TRADE IN YOUR
OLD IBM 38

New through June 30, your old personal computer could be worth up to \$1,000 in trade-in. Write or call PCI today.



Personal Computers, Inc.
6130 Carnegie Avenue
Bloomfield Hills, CA 91367

I want to know more about PCI's new Series 200—and up to \$1,000 trade-in offer.

Name _____ Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Telephone _____



- Auto callback security.
- Password security.
- Specific device routing.
- Auto login/logout.
- Blankets.
- CMT (Printer Emulation).
- File transfer support.
- Customized terminal tables.
- Behavioral screen updating.
- Bulk configuration.
- 4800 baud 41 control port.
- Easy protocol upgrades.
- IBM to SNA or 3270 to SNA.

IBM is a registered trademark of International Business Machines Corporation. PC/XT and AT are registered trademarks of Intel Corporation, Inc.

Woolworth Systems, Inc. has announced Version 3.0 of its Application Development & Development (ADD) system for the IBM System/34 and 38.

Enhancements to Version 3.0 make the system easier for nonprogrammers to use, a spokesman said. Also included is a simplified 90-page manual providing an introduction to the system.

The ADD system can create job streams consisting of combinations of sorts, reports, prompt screens, CCL procedures, batch programs and on-line inquiry and maintenance programs. In Version 3.0, the process of setting up a job has also been streamlined, the spokesman said.

The price for Version 3.0 of the ADD system is \$3,500.

Woolworth Systems, P.O. Box 2776, Suite 1, 280 Park Ave. N., Westport, Pa. 15770.

CS Laboratories, Inc. has introduced C/Script II Plus, an applications development tool for Data General Corp. computers under DG's AOS and AOS/V operating systems.

C/Script II Plus lets all-level users generate loan reports, file maintenance, inquiry and audit report programs through DG's Info II Data Base Access module. The product automatically generates Cobol I/O source code, the vendor said. Changes in the file maintenance records can be tracked through the product's transaction logging facility.

Users can generate file maintenance programs with defaults displayed within or outside of fields. Up to 99 screens or windows per file maintenance program can be accessed for data input. Screens can then be viewed sequentially or selected from a screens menu.

C/Script II Plus team sells for \$12,500 for AOS, and \$18,000 for AOS/V. CS Laboratories, 450 N. Dean Road, Auburn, Ala. 36830.

The Right Information at the Right Time... at No Charge to You from Comdisco Now Available On Cassettes!

Our Comline Reports have proved so popular, we put the latest issues on cassettes. Now you can keep current at your convenience... at home, in the car, or wherever your busy schedule takes you. On tape or in print, Comline Reports will keep you up-to-date on the issues that impact your company, your data center, and your equipment planning decisions.

The Information Crunch

Today's data processing professionals are required to be practical technicians, inspiring managers, and masters of all that's new and current. Responsible for day-to-day operations as well as keeping management informed of the big picture, it's no wonder that DP managers have little time for in-depth analyses of critical industry issues.

The "COMLINE" Solution

Comdisco's Comline Reports are a means through which industry professionals can take advantage of the experience and information which flows through our technical, financial, and marketing

channels. Authored by Comdisco's Professional Resource Team, Comline Reports are loaded with valuable insights to help you manage your operation more successfully in today's changing DP environment.

Why Comdisco?

Comdisco is the world's largest reseller of IBM computers and peripherals, and has consistently set the standard of excellence in the computer leasing industry since 1958. Today, our role in the industry as authorities and advisors on data processing topics has expanded dramatically. From financial issues... to capacity requirements... to compelling disaster recovery obligations...

Comdisco professionals are making the effort to keep you informed of the issues. To thousands of Comdisco customers, our name and our standard of quality service is second nature. To those of you who would like to learn more about the expanding scope of our services, as well as subscribe to our Comline Reports, we invite you to clip the coupon below.

COMDISCO®

Comdisco, Inc.
6400 Shafer Court
Rosemont, IL 60018
312/698-3000

Order Your Comline Reports Today! (Limited Offer) The current Comline Report issues are specified below. Simply indicate the reports you wish to receive, and mail us the coupon today!

Available on Cassettes: Hurry, quantities are limited

- ☐ ☐ The 4381 Market's Great Opportunity As An Alternative to a 4381
The 4381 may be your answer why a used 4381 can be your best buy as an alternative to a 4381.
- ☐ ☐ Leasing Plan With Telecommunications
Our PPS reports can help you develop a sound strategy for your communications requirements.
- ☐ ☐ Changing A Leasing Company
What is re-leasing? How critical is it? Can you succeed without it?

Current Issues—Print Only

- ☐ Large Mainframe Update: The Used 3090 Market
How to take advantage of lower cost, used 3090's and IBM's new 3090's are defined.
- ☐ SA Migration: The Hardware Solution
The "talk of the town" ...and is it for you?
- ☐ The DMS2 Market: 200's versus 200's
New technology is not a good enough reason for choosing 200's. A combination of 200's/200's may work best.
- ☐ Case Recovery: The Problem To A Disaster Recovery Program
The simplest way to get a Disaster Recovery Program in motion.
- ☐ Customer Value/Vendorage Program
What they are...and how to take advantage of them.

☐ PCs—Controlling the Spreading Epidemic

As with mainframes and peripherals, leasing PCs on short terms from Comdisco makes sense.

Future Issues

- ☐ The Real Impact of Storage/200
What is 200's long-range CPU game plan? How the customer can make 200's storage work for him, too.
- ☐ Dual Quantity 200's
Do you need them? What is the real price performance? What are the long-term backup work for him, too.
- ☐ Data Center Reliability
See how Comdisco can duplicate your data center—a total service offered by no one else in the industry.

Name _____ Title _____
Company _____ Phone _____
Street _____ City _____ State _____ Zip _____
CFLA/Instilled _____

Mail to: Comdisco, Inc., 6400 Shafer Court, Rosemont, IL 60018 312-698-3000

CW

Update

May 6, 1985

TOWARD THE FIFTH GENERATION



REPRODUCE STARS WITH TEKNOLEDGE



THE \$10,000 SOFTWARE PACKAGE
THAT SELLS ITSELF



TEKNOLEDGE, INC. • TEL: 800-368-6666 • WWW.TEKNOLEDGE.COM

Update

Toward the fifth generation

The mind of man is capable of anything — because everything is in it, all the past as well as all the future.

— Joseph Conrad

The future seems to me no unified dream but a mince pie, long in the baking, never quite done.

— E. B. White

By Glenn Rifkin
Update Editor

It is 1986 and the popular images of science fiction have been transformed into fact: intelligent humanoid machines in the form of robots; computers that see, hear, speak and reason; knowledgeable systems that are nourished by the input of a genius' storehouse of wisdom, able to hold and use that knowledge forever. A decade of intense research and creation has led to breakthroughs that have set the computer world at the threshold of fundamental change.

This script for tomorrow, however, is not from a Hollywood dream factory or the pages of an Isaac As-

imov novel. These images are the very practical perceptions of researchers in both academia and industry, and the boundary between fact and fiction has grown increasingly hazy. The future is no longer measured in space odyssey fantasies but in the price/performance specifications of an industry waiting to explode. This is the fifth generation, the next significant step in the evolution of computing: the leap forward that, if successful, will bring the future in.

The fifth generation got its official start in October 1981 when Japan's Ministry of International Trade and

Industry coined the term to describe its goal of creating powerful, intelligent computers by the mid-1990s. Since then, fifth generation has become an umbrella description encompassing work being done in the fields of parallel processing, artificial intelligence, expert systems, robotics, natural language, vision systems and more.

Though much of the fifth-generation dream remains in an embryonic state, large sums of time, money and talent are being poured into its pursuit. Commercial applications for AI hardware and software — in the form of expert and knowledge-based systems — have begun emerging and are spawning what many consider to be the foremost future growth sector of the computer industry. DM Data, Inc., a Scottsdale, Ariz., consulting firm, has predicted that the market for AI products will reach \$4 billion by 1990 (see chart Update/4).

Collaborative work between manufacturers and universities, much of which is funded by the U.S. Department of Defense, is focusing on long-range goals and, in many cases, producing unexpected short-term payoffs. While the blue-sky possibilities of academic research often attract the most media attention, the near-term realities have already shown enormous potential in a myriad of applications.

The fifth generation is not without controversy, however. Debate has raged around AI, for example, since serious work in that field began in the 1950s. Not only technological but moral and philosophical questions about the concept of intelligent, "thinking" machines abound. Though pioneering work has been done in many of the subgroups that fall under the AI mantle, critics claim

that devising many of the algorithms needed to impart true human-like capabilities is simply not possible.

In addition, development of fifth-generation machines has, in some quarters, become a race between the U.S. and Japan for supremacy in these new technologies. Protagonists in the drive to organize America's push toward the fifth generation have argued that Japan, with its focused approach, is positioning itself to take a dominant role in what will be the worldwide market for intelligent knowledge processing machines (see Update/5).

This inaugural section of Computerworld Update will examine the march toward the fifth generation and where it might lead. As these technologies come down from the dizzy heights of speculation to the shelves of DP shops in corporate America, what is in store? What form will the new hardware architectures and software applications take? How is the military spurring on major

See FIFTH UPDATE/4



"All our '86 models have the 'memory' feature but if you can hold until '87 they will have a preconscious and an IQ."

Index

Supercomputing	7
by Kenneth G. Wilson	
Japan and the race to the fifth generation	8
Interview	
AI and the DP manager	15
by Howard Dicken	
What's happening in Europe	18
by Kenneth Sonenclar	

COVER ILLUSTRATION BY KAREN WINTSON

Update

FIFTH from UPDATE/3

work in the field? Which companies and individuals are showing the way, and how is the rest of the computing world responding? And how will the DP or MIS manager be affected by the influx of new ideas and the products that follow?

Birth of a technology

The desire to create a machine capable of imitating intelligent human behavior has long held fascination for those dabbling in both science and science fiction. As computing technology began to mature in the 1960s, the idea of an intelligent computer, able to think, speak and move about on its own, took hold of a small group of university-based computer scientists, and the field of artificial intelligence was born.

For the next quarter of a century, however, the core of AI research remained an academic exercise in speculation. The computers delivered by industry were simply not powerful enough or versatile enough to take on the herculean task of reasoning.

The major centers of AI research, including MIT in Cambridge, Mass., Carnegie-Mellon University in Pittsburgh and Stanford University in Palo Alto, Calif., combined the available industry technology with their own wizardry and created prototype machines capable of running simple AI applications. These machines were used to initiate early research in expert and knowledge-based systems.

It has only been in the last five years, as the price and power of computers have headed in opposite directions, that AI has taken off as a viable commercial industry. Though the seeds and first fruits of AI have grown from traditional computing architectures, the consensus among leaders in the AI community is that a radical departure in computing will be necessary to reach the lofty goals to which the technology's boosters aspire.

The evolution of computational technology to date has generally been divided into four generations: vacuum tubes, transistorized circuits, integrated circuits and, finally, very large-scale integrated circuits (VLSI). While the computer industry is currently moving from the third generation of integrated circuits to the fourth generation of VLSI, work is already being done on the fifth generation of parallel processing.

Computer scientists now suspect that the sequential von Neumann architecture (named for the pioneering mathematician John von Neumann) may be inadequate for building computers able to process information

fast enough to usher in the age of AI.

According to W. Daniel Hillis, founder of Thinking Machines Corp., a fifth-generation computer start-up in Cambridge, Mass., "Programs become slow as they become smart. Today, we write [AI] programs that use a few hundred facts. We would like to increase this to a few million, but the programs already take minutes

to make decisions that must be made in seconds. Scaled up, they could take years. So-called von Neumann machines, even if they are built of exotic, ultrafast components, are ultimately candidates for solving these problems, since they are limited by the speed of light."

Despite continuing work with exotic but flawed materials such as gallium arsenide

See FIFTH UPDATE/5

END OF TABLE

System	Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
System 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
System 2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
System 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
System 4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
System 5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
System 6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
System 7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
System 8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
System 9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
System 10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
System 11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
System 12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
System 13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
System 14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
System 15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
System 16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
System 17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
System 18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
System 19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
System 20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

For more information, contact the publisher.

Source: IBM Data, Inc.

IF YOU'RE BUYING WILL THE COMPETITION

FOR INTEGRATED BUSINESS AUTOMATION, DISCOVER
DATA GENERAL'S CEO® SYSTEM.
IT'S WHY WE'VE WON MORE MAJOR INTEGRATED SYSTEM CONTRACTS
THAN ANY OTHER COMPANY.*

Today, survival means finding a business automation system that reaches every facet of your corporation. Companies such as E.F. Patton, Pectel Communications, Centel and Beneficial Corporation chose Data General.

BEYOND OFFICE AUTOMATION
Data General's CEO® System begins with all the office administration essentials. And takes you further to Business Automation. With spreadsheet, graphic and database tools to help your staff

make faster, better-informed business decisions. And because you can integrate these tools with your business applications, everyone has access to all the information they need.

Our communications networks put the

*Integrated systems contracts over \$15,000,000 value not include software, equipment and services contracts, as reported in Electronic News, IBM Week and Computer Systems Research Journal (January 1, 1985 and December 31, 1984).

Update

FIFTH from UPDATE/4

or Josephson junctions, which have the capability to dramatically speed up traditional sequential machines. "Computers as we have known them for the past 30 to 30 years are about as fast as we can make them," wrote B. L. Buzbe and D. H. Sharp of the Los Alamos (N.M.) National Laboratory in *Science* magazine.

"The demand for greatly increased speed can be met only by a radical change in computer architecture—from a single serial processor to a computer which is an aggregation of many parallel processors that can perform independent operations concurrently," the authors wrote.

Fifth-generation or non-Neumann machines, which will either depart

from or drastically alter current architectures, are under development in the U.S., Europe and Japan. These new supercomputers, employing parallel rather than serial processing, promise to bring about massive change in the computer industry during the next quarter century.

The concept of parallel processing is simple: Rather than having a single serial processor performing opera-

tions sequentially, the machine will employ thousands or millions of processors, each with its own small memory bank, working simultaneously on a single task or a multitude of tasks. The concept is not new. But the dramatic decrease in the cost of microprocessors has suddenly made the idea viable.

As many as 50 parallel processing projects are reportedly under way at U.S.

universities, including MIT; Cornell University in Ithaca, N.Y.; New York University; Stanford; Carnegie-Mellon; and the University of Illinois. These projects are being heavily funded by the U.S. Department of Defense Advanced Research Projects Agency's (Darpa) strategic computing project. Darpa is seeking machines that will increase by several orders of magnitude the speed with which expert systems and AI can be processed.

To illustrate the power difference, the Gurtner Group, Inc., a Stamford, Conn., consulting firm, pointed out that IBM's most powerful mainframes, the 3090 series, will operate at around 50 million instructions per second. The military is seeking to acquire machines capable of running complex expert systems at approximately 10 billion instructions per second.

Industry heavyweights such as IBM, Digital Equipment Corp., Control Data Corp. and others are already involved with parallel processing projects, and small start-up companies are finding their way into the fray. Thinking Machines, using research done at MIT, is at work on a prototype of its Connection Machine, a computer that uses 100,000 processors.

Though the company will not discuss the status of the machine, it is rumored that the prototype will be ready by 1988.

Parallel computation

Meanwhile, researchers such as Edward Feigenbaum of Stanford, are working on models for expert systems that will incorporate parallel computation. The problem of programming for parallel systems has not yet been solved and is considered a major obstacle to success. Feigenbaum is attempting to adapt for parallel processing a programming tool called the Blackboard Framework, which was originally developed at Carnegie-Mellon in the early 1970s, and actually makes parallel the tool's Lisp programming language. The project aims to show that this way of organizing the tools and the language can boost processing speed by several orders of magnitude.

The idea of massive parallel processing machines has, not surprisingly, crossed over to the traditional area of vector processors or supercomputers (such as the Cray Research, Inc. X-MP and Control Data Corp.'s Cyber series) and has caused some confusion. These giant, multimillion dollar number crunchers have not been targeted for AI or expert systems.

See NEXT UPDATE/4

YESTERDAY'S TECHNOLOGY, BURY YOUR BUSINESS?

pieces—from the most popular PCs to mainframes—together into one accessible, information mainstream.

And a range of Data General's compatible systems—from portables to department-sized clusters, to superminis—can fit even the most unique business problems.

YOUR BEST BUSINESS INVESTMENT

Our commitment to research and development protects your current investment. We offer a wide selection of service, training and support plans to forge your

system into a cohesive, competitive weapon.

Yesterday's technology won't fit your needs in tomorrow's business battles. To keep your company alive, talk to Data

General at 1-800-DATAGEN (In Canada 1-800-355-5454) or write: Data General, 4400 Computer Drive, MS C-228, Westboro, MA 01580.



Data General
A Generation ahead.

© 1985 Data General Corporation, Westboro, MA. CIB is a registered trademark of Data General Corporation.

Update

FIFTH from UPDATE/5

tems work per se, but attempts to make them even faster have embraced the idea of parallel processing or non-von Neumann processing as well.

According to Sid Pernbach, a San Jose, Calif.-based consultant, a parallel processing machine might be referred to as a "social" vector-type machine, "because you

can issue one instruction and have them all execute the same instruction at the same time.

"On the other hand, most of the parallel processors allow for a mix of instructions to be executed simultaneously as well," Pernbach said. "The potential, therefore, is greater, and as a matter of fact, you can build vector instructions into a parallel processing system so you can

have the best of both worlds."

The Cray-2, scheduled for delivery this year, and the Denelcor, Inc. HEP-1, for example, employ two to four processors already, and industry analysts predict that systems with eight to 16 processors may be available by the end of the decade. This is a far cry, however, from the dream of a million processors, and the supercomputer

industry continues to seek von Neumann solutions. The Cray-3, for example, scheduled for delivery in 1987, would be the first computer ever manufactured using gallium arsenide chips, which reportedly would make it five to 10 times faster than the Cray-2.

As supercomputers, which have traditionally been pigeonholed for scientific number crunching in government

and scientific labs, begin to move into new market areas, the potential for these machines to play a major role in the fifth generation becomes apparent. "The supercomputer of the future will be a parallel processing system, which consists of clusters of processors, each dedicated to a certain type of activity, such as AI, numbers, graphics or a combination of a lot of things," Pernbach predicted. "This is the direction we're going in, and it's going to take a good 10 years to get there."

Developing markets

"Free enterprises and profits are not waiting for the superparallel-processing computers," stated "AI Trends," a report from DIT Data consulting firm. Indeed, artificial intelligence programs are currently available for everything from personal computers to mainframes. The value of many of these programs has yet to be demonstrated on a wide scale, but the trend is clear. Vendors see a new market, and they are going after it.

'The super-computer of the future will be a parallel processing system'

— Sid Pernbach

Although AI-type programs can conceivably be written in a number of programming languages, the language of choice among AI professionals in the U.S. is Lisp (meaning List Processing), a 26-year-old symbolic programming language.

The newer Prolog language originated in Europe but is the choice of the Japanese in their push to develop fifth-generation machines. With its vast base of support and a long list of perceived advantages, however, Lisp remains the favorite in the U.S.

Among the traditional hardware architectures, the DEC VAX minicomputer is the most widely used for Lisp-based AI programs.

Personal computers have just recently joined the artificial intelligence fray and, because of the memory and power requirements of most Lisp software, have proven to be a target for the top-end expert systems that have recently proliferated.

That, of course, will be changing radically over the next several years.

According to the Gartner Group, "the ubiquity of [personal computers], in general, is making for a market that is too large to ignore. If nothing



Give your Information Center users freedom of choice.

RAMIS II is the comprehensive software system that makes your Information Center work ... for everyone. It meets the needs of both end user and computer specialist, allowing each to be significantly more productive.

The key is *freedom of choice*. For instance, end users have not one, but three ways to produce reports (depending on their computer expertise and preferences). Inefficient menus for the novice; everyday English at the executive level; and a powerful fourth-generation language for the experienced user.

But this is just the beginning.

RAMIS II provides additional choices for data access, graphics, statistics, PC integration and more.

And, the choices **RAMIS II** offers do not stop with end users. Your Information Center staff may select their own options in education and training, user assistance, and data security.

Learn more about the power of **RAMIS II** at a free Mathematics Seminar on Information Centers. To receive a seminar schedule, call today, or return the coupon.

Take the first step to greater productivity with **RAMIS II's** freedom of choice.

MATHEMATICA		ON 54
P.O. Box 2392 Princeton, NJ 08540		
1-800-257-5175		
<input type="checkbox"/> Please send me a schedule of RAMIS II Seminars on Information Centers. <input type="checkbox"/> Please send more information describing RAMIS II.		
Name _____		
Title _____		
Company _____		
City _____	State _____	Zip _____
Telephone _____		
Computer _____	Operating System _____	
MATHEMATICA		
MARTIN MARIC LTD.		

RAMIS II... THE LEADER BY DESIGN

Update

else, many users will demand that AI programs be deliverable over a [personal computer]."

In addition, micro-based expert systems using natural languages serve as demonstrators of the viability of AI technologies and "work to the aid of individual end users eager to spread the gospel within their organizations."

As microcomputers with increased capabilities, such as IBM's Personal Computer AT, appear, the number of available, useful micro-based AI applications written in Lisp will increase. Lisp requires a large amount of memory and horsepower to be effective, however, and the current choice of serious AI users remains the dedicated Lisp machine.

The major difference between dedicated Lisp machines and computers that run Lisp is that the dedicated machines have been imbedded with more than 12,000 Lisp functions in the programming environment to optimize the language.

With an appropriate interpreter, Lisp will run on other hardware but will show a corresponding loss of performance. According to Henry Firdman, a Lexington, Mass.-based AI consultant, Lisp offers highly efficient memory management, interactive programming environments, multiwindow capabilities and advanced graphics.

Burgeoning market

The market for Lisp machines is a burgeoning one, though it remains minuscule in comparison with the greater computer industry. Since the first machine — the Xerox Corp. 1100 — appeared in 1961, the market has grown to an estimated \$183 million this year, according to the Gartner Group.

Estimates of the market's growth by 1990 vary widely. Find/SVP, a New York-based consulting firm, predicts a \$2 billion market, while Arthur D. Little, Inc., a Cambridge, Mass.-based consulting firm foresees a \$10 billion market. Firdman cautioned that a breakthrough in technology during that time period could make the projections inaccurate. "AI is currently an industry of tools, not products," he stated.

While those numbers have not spawned a flood of start-ups as in the micro software business, it has generated interest within a growing segment of the industry. Currently, the market leaders are Symbolics, Inc.; Lisp Machines, Inc.; and Xerox. Texas Instruments, Inc. has just entered.

See FIFTH UPDATE/10



Enter a Powerful New Age of CICS
Performance Management

Update

In October 1981, Japan's Ministry of International Trade and Industry unveiled a set of ambitious plans for its fifth-generation project. Funded to the tune of \$650 million over the next decade, the fifth-generation

domination of the industry, suddenly loomed as a potential giant.

Six months later, the Japanese announced the formation of the Institute for New Generation Computer Technology (Inct), which would guide this massive assault on the computer age. American and European industries began to react, and several national consortia sprang up quickly to decide how to counteract the Japanese plans.

Many leaders in the computer industry and academia in America, however, were vocally skeptical about the fifth-generation project.

"It's just a smoke screen" and "a major public relations effort" were comments commonly heard. The U.S. just had too much firepower, too many top minds, too much money and a company called IBM, to allow the Japanese to horn in on this valuable territory.

In March 1983, Prof. Edward A. Feigenbaum of Stanford University and Pamela McCorduck published *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World*. In it, they

wrote: "The Japanese have soon got on distant hills and have begun to move out. Japanese planners view the computer industry as vital to their nation's economic future and have audaciously made it a national goal to become number one in this industry by the latter half of the 1990s."

"The consequences of complacency, of our spirited attention to the present at the expense of the long view, will be devastating to the economic health of our most important industry. The Japanese could thereby become the dominant industrial power in the world."

Among those who responded to the book was William F. Zachmann, vice-president of International Data Corp., a market research firm in Framingham, Mass. Zachmann penned his own report in which he firmly disagreed with the authors.

Computerworld Update met first with Feigenbaum and then with Zachmann and asked them each to consider once again the issue of Japan's fifth-generation project and its potential impact on the U.S. computer industry.

The race to the fifth generation

Does Japan have the inside track?

project would trigger a quantum leap forward in computing, a leap that would lead on the doorstep of the future with powerful, intelligent machines interacting with humans via natural language, graphic images and speech.

The fifth-generation announcement shocked the computing world. Japan, which had yet to assert itself dramatically in the worldwide computer marketplace and was not perceived as a particular threat to U.S.

INTERVIEW

Edward Feigenbaum

Two years have passed since your book was published. Has anything changed in your outlook? What is the status in Japan?

In the first three years of the last project, my feeling is that Japanese computer science and technology closed the artificial intelligence gap. [The U.S. has] more activity, but we

don't have better activity going on here. They have now understood and practiced AI enough to be state of the art throughout most of the industrial firms.

Basically, both countries are starting out even in the era of parallel computing for AI. We both have the same number of ideas, which is very little. They have extraordinary focus and momentum. We have extraordinary diversity and almost intentionally unfocused activity.

We'll see which one pays off in the next few years. Phase II [will last] four years for the Japanese. Four years is enough time to give us a good running start on parallel computing.

To see how a wide-ranging, innovative, defocused program like ours can compete with an intense, narrowly focused effort like Japan's is really one of the most interesting technology experiments that has ever been done.

What is the current timetable for Inct?

The Japanese held the second international conference on the fifth generation last November to signal the end of Phase I of the project and herald the beginning of Phase II [on April 1, 1985].

The Japanese said they were going to use the first three

Do you perceive a serious threat from the Japanese fifth-generation project to our place in the computing industry?

I do not think the probability is very high that the Japanese fifth-generation project will result in some major competitive advantage for the Japanese. On the other hand, I believe [artificial intelligence], expert systems and software systems that aim in one way or another to extend human mental capabilities the way a bulldozer extends human physical capabilities will unquestionably be a very important part of the future.

The Japanese project suffers from some serious problems in that it is based on some premises that are likely to prove incorrect.

Please explain.

The role of nonnumeric processing, for example. I rely for authority on a paper titled *Overview to the Fifth Generation Computer System Project* by Prof. Toru Mote-Oka of the University of Tokyo, published in 1983.

One of the statements he makes is that "current computers have extremely poor performance in basic functions for processing speech, text, graphics, images and other nonnumerical data as well as for AI-type processing."

William F. Zachmann

such as inference association and learning."

That is the key to a very important assumption here. The assumption is that AI applications, which fifth-generation computers are supposed to support, essentially require capabilities that current computers don't have. I would take issue with that statement.

'Japan has extraordinary focus. We have extraordinary diversity.'

— Feigenbaum

'The Japanese project suffers from some serious problems.'

— Zachmann



Update



Feigenbaum

years for learning, tool building and fundamental conceptualizing — in other words, as a catch-up period. That's exactly what they did.

During Phase I, they built a pair of sequential Prolog machines, one of which was state of the art in comparison with the Lisp machines available in this country. The second was far in advance of American state of the art with regards to speed. They constructed large Prolog programs and gained a tremendous amount of experience in logic programming.

They also created several interesting and complex expert systems applications using Prolog, and they began the process of disseminating the knowledge about AI languages, representation and expert systems widely throughout industry. They now have an extended family of industrial people working on logic projects that numbers in the neighborhood of 200 to 300 trained individuals.

The core group of people, which was originally 40, is now 48 and will climb to 100 in Phase II. So there are three rings of people for Phase II: 100 for the inner group, 1,000 in the lot extended family and about 10,000 people in the whole industrial picture, including lot. That's a massive training effort. The Japanese, no matter what they achieve in Phase II and III, will have built themselves an enormous infrastructure of educated, well-trained people in symbolic computation and AI.

How has the U.S. responded to this?

Since the book came out, some very positive things have happened in this country and Europe. There's a broad recognition of the importance of the symbolic manipulation technologies including AI and its associated machines. Darpa [Defense Advanced Research Projects Agency] launched its huge strategic computing project, which is primarily focused on high-speed symbolic computation. The industrial firms in the U.S. have picked up interest in the field to an astonishing degree. And that's one place where we differ from the Japanese.

The Japanese have a good industrial interest, but it runs narrow and deep in a few companies. We have a very broad industrial interest.

To the extent that I am able to see into the industrial picture, I am astonished at the range of AI going on here. It's really breathtaking how many companies are establishing groups and training themselves.

Yet you continue to be concerned

about AI growth?

The primary danger to these activities in the U.S. and Europe is defocusing. The Japanese project is focused on AI and its applications. The programs in the West are broad-ranging programs, except for Darpa.

The Japanese normally handle things by multiple national projects. The fifth-generation is just one project along a wide frontier, whereas the Western projects tend to cover everything with one project.

Because the Darpa project is funded by the U.S. Defense Department and must be mission-oriented, [a lot] of the strategic computing money will be spent for military-oriented test beds. The Japanese do not have to shoulder that defense burden.

Critics of your work tend to feel that we are so strong, even in unfocused ways, that we will not lose to the Japanese in the long run.

Ten years is a long time, and small gains per year can compound into significant shifts of position. In 1972, the Japanese had not produced a single commercial chip when they launched their national semiconductor

"Some very positive things have happened in this country and Europe. There's a broad recognition of the importance of the symbolic manipulation technologies."

— Feigenbaum

tor activity. In 1982, they had 60% of the world's market for 64K-byte RAMs [random-access memories]. They are capable of moving very rapidly, and in my view, they are moving into an area which [has] the maximum growth potential for the information processing industry.

There is still a vast unoccupied territory in that universe, and that is the territory occupied by symbolic processing applications, particularly those which we know of as AI. That's a very important area in which to occupy territory, and that's what the Japanese are intending to do.

Is this the greatest obstacle to our own fifth-generation push — the unwillingness to team up for focused national effort?

Obstacle is the wrong terminology. You have to call these things "national characteristics." We have national characteristics of independence — the desire to push along our own track rather than to be focused into someone else's track.

Are you encouraged in any way about changes in our efforts or are we as individualistic as ever?

We are as individualistic as ever. There's no change in the spirit of cooperation, none whatsoever. The encouragement has been in the breadth of response — but not in the cooperative nature of that response.



Zachmann

There is no question that current computers do just fine processing speech, text, graphics, images and other nonnumerical data. I see no real reason to conclude that current computers are inadequate for AI applications or nonnumeric processing.

What about the search for these super, high-powered computers?

It is not sustainable by the facts to claim that somehow there are these AI, Prolog-type, brute-force inference engine applications just waiting for bigger, more powerful computers. If there were such applications, they could run on existing computers. In fact, the obstacle to those AI applications is not hardware at all. It's partly that the imagination that has been used in building those kinds of systems is as yet insufficient. It's partly that the model is incorrect.

What will make the important things happen?

If you approach it from the purely formal point of view, which is what logicians and academicians tend to do, then it seems that if you only had this super-fast engine, it would solve all the problems of the world.

In fact, that's not the case. There is lots of hardware available to run Prolog or anything else you want to run. The real obstacle is that the AI software has not been intelligently enough written yet.

What are the obstacles to software being written?

One of the things we're going to find when we get more seriously into the concept of expert systems is that the expertise just isn't there. One of the phenomena of human life generally is that you and I can decide we're experts on something or other. I say you're an expert, and you say I'm an expert. We talk a lot of mumbo jumbo, and nobody knows the difference.

Most of the social sciences have that characteristic. Psychology, sociology, economics are, in fact, an enormous mass of mumbo jumbo. The idea that there's all this knowledge just laying around waiting to be put into computer systems is not so.

What about the assumption that AI and knowledge-based systems will typically be large and complex?

That assumption is also incorrect. While there certainly is a class of AI applications that may require com-

plex inference engines, the most important AI applications will run on personal computers.

A lot of people in the industry still view this as a race between the U.S. and Japan. The Japanese are pouring a lot of money and effort into this focused effort. Is their effort not to be taken seriously?

There is no question that the fifth-generation project has been a very effective public relations effort for the Japanese. It has given the sense that they are very leading edge and looking to the future. They've certainly had the support of a number of American and European academics in sustaining that particular illusion. The idea that this is going to give the Japanese an objective leg up on the rest of the world is not sustainable by the facts.

There's very well may be some useful things that result. However, I don't think they will have the breadth of reality-level impact that is implied. The amount of money is not that huge. If you compare it with IBM's [research and development] budget, it's a drop in the bucket.

There are a lot of people in Japan

"You and I can decide we're experts. I say you're an expert, and you say I'm an expert. We talk a lot of mumbo jumbo, and nobody knows the difference."

— Zachmann

who obviously know better. In fact, my understanding [is] that the second round of [funding] for the project was by no means enthusiastically supported by all of the people involved.

One of Prof. Feigenbaum's major points is that it is characteristic of the way the Japanese attack these problems to come at them with a very focused, cohesive approach. Americans, on the other hand, characteristically take a much more is individualistic approach — everyone essentially doing their own thing.

Prof. Feigenbaum is incorrect if he maintains there is a radical difference between the U.S. and Japan in that regard. Dedicated, focused effort toward achieving objectives is certainly as much a characteristic of U.S. companies as it is of Japanese companies.

Do you feel that fifth-generation-type work is so far ahead or blurry that it is missing the point?

It's not even that they are so far ahead; it's that they are [going] in the wrong direction. [It's like] the old Islamic saying, "I fear you will never get to Mecca, my friend, for you are on the road to Kaaba, focusing all that approach 'too far ahead' gives it more credit than it deserves. It's not too far ahead; it's just silly. It's not relevant to the much wider range of real-world problems.

Update

FIFTH from UPDATE/7

the market with its Explorer machine after several years of extensive AI research, and Sperry Corp. has signed an agreement with TI to build a Lisp processor that will be integrated into Sperry's product line.

The current state of the art is, indeed, limited by power and memory requirements of computers as well as the need for breakthrough-type algorithms to transfer more subtle aspects of human reasoning and intelligence to computers.

Industry analysts predict that over the next few years, Lisp machines will move from their current installed base in universities and U.S. Department of Defense facilities to private industry. This movement is

Expert systems are the closest we can get to cloning. We capture the expertise of a good production manager. We distribute copies of the rules to spread the expertise around.

being led by Xerox, which wants to use its other businesses to help bring AI into such new areas as the office marketplace.

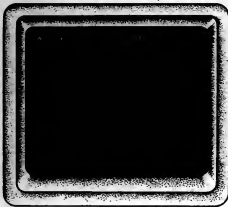
Xerox approach differs

Unlike Symbolics, which sells its high-powered, single-user systems, considered the Cadillac of the industry, at a premium price, starting at \$60,000 and going up to a fully configured \$150,000, Xerox is trying a

different approach with the technology it has been developing since 1970 at its Palo Alto (Calif.) Research Center. Its 1108 Lisp machine sells for \$21,950 in base configuration.

"Our desire is to get the AI applications revolution under way and get AI into the day-to-day operations of the Fortune 100," explained Ben Shell, manager of product development for Xerox's AI Systems Business Unit.

Introducing INTELLECT/FOCUS.



**In plain English,
it makes FOCUS work for anyone.**

Until now, FOCUS* has been a 4GL/DBMS for Information Center and data processing professionals. But now *everyone* in your organization can get the benefits of working with FOCUS. Through new INTELLECT/FOCUS.

INTELLECT/FOCUS automatically translates plain, everyday English into sophisticated FOCUS command language. So even non-technical end users can get their own data from FOCUS and make decisions faster. Data processing and Information Center professionals can be free to spend time on their own productive tasks rather than chasing down data for others.

New INTELLECT/FOCUS also generates its own lexicon automatically, then builds and maintains the lexicon in everyday English, so it's as easy to install as it is to use.

CALL 617-890-8400 FOR A DEMO DISKETTE.

If you'd like, we'll send you a free INTELLECT/FOCUS demo diskette. Once you've seen for yourself how easily our new product can get everyone in your organization into FOCUS, you'll realize how much more you can get out of this powerful program.

Just by using a little INTELLECT.™

8 artificial intelligence

100 FIFTH AVENUE • WALTHAM, MASS. 02154 • (617) 890-8400

*Focus is a product of Information Builders, Inc.
INTELLECT/FOCUS runs on IBM and IBM-compatible mainframes.

According to Shell, all the major vendors will soon offer some kind of support for AI. "It's a niche market, but as viability grows, I expect everybody to be in there," he stated.

Software expert systems

In the drive toward the fifth generation, the first shining star has been the expert system. Although it has been the subject of much criticism — called "empty mimicry" by *Fortune* magazine — the expert system has its origins in AI research, and if it remains a giant step away from true human intellect, it is already serving as a bridge into the revolution.

Expert and knowledge-based systems are rule-based (IF-THEN) computer software programs that can be used to model complex problems and solutions. The expert system derives its knowledge from a living expert in a particular field, and the knowledge-based system draws from books, reports and other nonhuman resources.

The components of an expert system are simple: The human expert is debriefed by a knowledge engineer — a new profession born out of this research. It is the knowledge engineer who creates a data base of facts and inference rules — incorporating into this as much human subtlety as possible.

These rules are then processed through a decision-making computer program, called an inference engine, using either backward chaining (working backward from the conclusion to the facts needed to support that conclusion) or forward chaining (gathering facts to reach a conclusion).

The results are generally distilled through a natural-language front end or interface. Users of the system can then interact in English-language commands with what is now a sophisticated expert assistant.

Closest to cloning

"Expert systems are the closest we can get to cloning," said Richard E. Morley and William A. Taylor of Gould, Inc. in a report on expert systems.

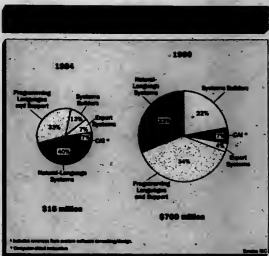
"We capture the expertise of a good production manager. We distribute copies of the rules to spread the expertise around. We no longer fly our expert all over the place."

Expert systems have been used with success in the fields of medicine and geology and in the military. The key to success with these systems is closely tied to the degree of difficulty of the problem to be solved. If the problem is too broad and the scope too vast, the expert system of today will likely fail.

John McDermott, principal scientist in the computer science program at Carnegie-Mellon University in Pittsburgh, has developed a number of highly successful expert systems, most notably the Xcon system for Digital Equipment Corp., which configures its VAX minicomputers to fit individual customer needs. Xcon reportedly saves millions of dollars annually for DEC.

"I've been fairly fortunate in picking problems that are the right size, given the state of the technology," McDermott said. "The problem is that if you pick things that are too easy, people laugh. If you pick things that are too hard, then you fail. Get-

Update



using the right size problem that can be successfully solved with the current state-of-the-art technology is key."

The current state-of-the-art is, indeed, limited by power and memory requirements of computers as well as the need for breakthrough-type algorithms to transfer more subtle aspects of human reasoning and intelligence to computers.

The "intelligence" of expert systems has been called into question. Critics claim that existing expert systems have no more connection to intelligence than many conventional computer programs, and that the mechanical manderings of a computer can hardly compare to the "rich associations, metaphors and generalizations that language evokes in people and that constitute the essence of meaning and thought," according to *Fortune* magazine.

Karl Wieg, director of AI at Arthur D. Little, Inc. (ADL) in Cambridge, Mass., admitted that a number of expert systems are overrated. He cautioned that people may have misconceptions or false expectations of the difficulty of creating a good expert system.

"Some people feel cheated because they expect systems to live up to a lot of overinflated expectations," Wieg explained. "What they have to understand is the cost of building these systems is much higher than, say, building a decision support system for the same purpose."

"You are not dealing with a human who learns relatively easily. You are dealing with a machine that must be spoon-fed. As a result, the cost of being sufficiently explicit on a subject is going to be very high."

Consultant Henry Firdman said there are additional obstacles to creating broadly useful expert systems. Knowledge engineering, for example, is labor-intensive, expensive and requires skills that are in short supply. In addition, current hardware and software tools are expensive and difficult to learn to operate. And finally, there is resistance among experts whose turf is threatened. "People don't like to be replaced," Firdman said.

Thus, two camps have been set up under the expert systems umbrella. There are those, primarily in academic research environments, who are mainly interested in the potential of transferring human intelligence to machines. Others, particularly in industry, take a more practical view.

"I see the development of systems that are very narrow and specialized and can provide expertise in a very limited area," Shell of Xerox said. "They must leverage a fairly nonsequential professional, like the petroleum geologist [for whom] Schlumberger Ltd. built its expert system [called Dipmeter

Advisor]. There you have a small number of people in a very specialized field who make decisions that have millions of dollars [hanging] on them. You can justify systems that help them make small adjustments in the quality or speed of those decisions. AI is particularly well suited to those types [of] things because it is a depth rather than a breadth of knowledge," Shell said.

"The academics are trying to understand intelligence," added Arnold Kraft of DEC's AI group. "We're more pragmatic. We say, Here's another set of nifty tools to help you solve problems."

At DEC, the widespread use of Xeon has had an extremely positive effect beyond the money saved on VAX configuration. According to Kraft, the company is moving at full speed into further AI research with more than 200 people devoted to research and development work in that area. "Our goal is to take the abilities of our best people and make them available to other people generally upgrade everyone's capabilities," Kraft said. "The result of that is the people who are very good get to go on to yet harder problems, and the [drudgery] is gone for them. The others actually learn through the program, which is like the eyes and ears of the expert."

Industry is getting heavily involved in expert systems research. It is estimated that more than 200 of the Fortune 500 companies have set up internal AI research groups, although some efforts are considerably more substantial than others. Such giants as General Motors Corp., General Electric Co., Martin Marietta Data Systems, Inc., Lockheed Aircraft Corp., Hughes Aircraft Co., TRW Corp. and United Technologies Communications Co. all have major AI projects under way, and ADL predicts that corporate and government spending for AI will reach \$1.25 billion annually by 1990.

For the market to explode as predicted, however, the applications emphasis for expert systems must make a dramatic shift away from the one-of-a-kind geological, medical and military applications of the past and move toward more commercially oriented areas of business/financial decision making, equipment diagnosis and maintenance and manufacturing planning. For large vendors first entering the AI business, it is a matter of shaping internal thinking.

At Hewlett-Packard Co., it's P. Goldstein of the Computer Research Center is leading a major effort to bring AI and expert systems to HP's desktop line of computers. Although he would not reveal specific product offerings, Goldstein said that the first such products would be available in 1986. For HP, there is a natural expert systems connection between its computing and scientific diagnostic equipment, according to Goldstein, and in fact, the company already has an early expert system available for its electrocardiographs.

HP, however, wants

to expand its use of expert systems deeply into the software development, manufacturing and office technology areas. For Goldstein, the technology questions are eclipsed by a larger issue. "One of the largest problems you face is how to transmit the culture in order to shift the paradigm. How do you train the several thousand software engineers at HP to be conversant [with] this technology?"

While the large companies grapple with this, the concept of bringing expert systems to a mass audience has created what many believe is the leading business opportunity in the field: expert systems development tools. These development tools are generally shells, or the framework of an existing expert system with its specific knowledge base removed.

The first such shell was Engiscan, developed at Stanford University, which was the inference engine and knowledge-base management system for Mycin, an early expert system also developed at Stanford and used in medical diagnosis. Since then, a spate of start-up firms, many with university ties, has emerged to sell these development tools.

Among the early competitors are Teknowledge, Inc., General Research Corp., Smart Systems, Inc., Inference Corp., Software AAE and Intellicorp. Such major firms as Xerox, McDonnell Douglas Automation Co. and Tymshare Corp. also offer such tools while others such as DEC, Data General Corp., Texas Instruments, Inc. and IBM are said to be working on versions for their customers.

The field of expert systems tool development will grow at a rate of 60% per year soon, according to Frederick Hayes-Roth, chief scientist for Teknowledge, a market-leading, four-year-old Palo Alto, Calif.-based firm. GI spent \$3 million to acquire an 11% equity in Teknowledge in 1984, signaling the beginning of a strategic business relationship between the two companies.

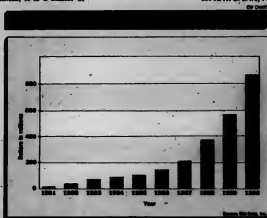
"In five to 10 years, expert systems will be everywhere," Hayes-Roth said. "Whether you know you are dealing with one or not, I'm uncertain. Some people use expert systems and AI to configure products for their customers, but they don't tell them they are using AI. Some customers are simply not ready for it, and in some cases, the company doesn't want its competitors to know it is using AI."

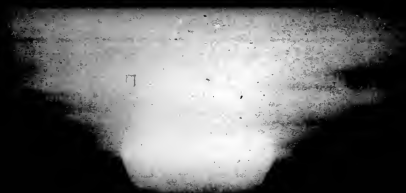
The costs of doing an application using an off-the-shelf tool, such as Teknowledge's S.I. or M.I. packages, are going down so dramatically that the number of applications is increasing tremendously, Hayes-Roth said.

The problem for suppliers like Teknowledge is that the technology is brittle and is only good for re-creating highly specialized talent. Without the resources to produce custom systems for countless clients, Teknowledge said it felt the best step would be to help people do it themselves.

According to DM Data, Inc., as the industry becomes more experienced with this option, the

See FIFTH UPDATE/14





Update

FIFTH from UPDATE/11

documentation improves, this do-it-yourself approach to creating expert systems will increase dramatically because of cost-effectiveness and increased security on systems. The consulting firm predicted that these framework systems will account for more than half the market by 1990.

"Within the next few years, some knowledge acquisition tools will be developed that will make it possible for people with only modest amounts of AI experience to develop first-rate systems in a handful of domains," Carnegie-Mellon's McDermott predicted. "With that, we'll see a jump in the number of expert systems out there."

Despite the growing excitement

about this budding industry, those within the field are keeping the technology in perspective.

"Will it change our lives in five to 10 years?" Hayes-Roth asked. "I doubt it. The computer didn't change our lives in five to 10 years, and this won't either. It will make a lot of money in that time, however."

"There's nothing special about expert systems now," McDermott added. "As increasingly powerful techniques are discovered, however, they will be ex-

ploited in applications programs so that through an evolutionary process, in 20 or 30 years, we'll have some truly impressive machines." For the DP professional, the impact of expert systems will be long in coming, according to ADL's Wig. "Cobol will stay around for a long, long time," he said. In addition, the majority of users for AI tend to be focused on the management of knowledge within the organization — dealing with professional content and the organization of professional activities.



Hayes-Roth

professional content and the organization of professional activities.

rather than with actual implementation or writing code.

In the future, however, expert systems will have such an effect on how an organization does business "that it will require a totally different alignment of what you think of the DP professional," Wig pointed out. "I know of many DP managers who had difficulties adapting to the general concept of management information systems when that concept came about. They wanted to continue to operate the computer center and were not very interested in changing the concept to supporting management within the organization. With this, we are dealing with a much more drastic revolution."

Need for natural language

Undoubtedly, computer scientists of the future will look back at current expert systems as crude and simple forerunners to offerings today's users can only imagine. Among the key obstacles to reaching the next generation is the task of implementing cognitive understanding on a machine. With all the advances to date, a computer is still only capable of understanding what is programmed into it.

Creating a natural-language interface for the computer is the first step in that complicated process. From overexposure to science fiction movies and literature, computer neophytes have come to expect that systems understand everyday English commands.

In fact, natural-language understanding is in an embryonic state, and getting a computer to comprehend the broad and complicated nuances of syntax and semantics has not yet come very far. How, for example, does the computer differentiate between "Time flies like an arrow," and "Fruit flies like an apple?" According to Firdman, "Out of sight, out of mind" was translated into "an invisible mantic" by a computer.

Cognitive science, a field that combines computer science and cognitive psychology, has attempted to quantify natural-language understanding, but it is like peeling an artichoke. The more layers you peel away, the more it seems there is to get through. For the use of computers to reach a maximum audience, particularly in business settings, natural-language interfaces must allow access to data bases, decision support systems, spreadsheets and the like without the intimidation of computers.

Roger Schank, professor of computer science and psychology at Yale University, has been a pioneer in natural-language understanding. After more than a decade of research in the field, Schank has become less convinced of the immediate payoffs of AI. Speaking at a recent workshop of the Information Industry Association at Hyannis, Mass., Schank pointed out that AI is no more available today than it was 10 years ago. "AI has as its goal something so complicated and so difficult that it will never be here," he stated. "By that I don't mean that AI is impossible. I just mean there will always be more to do."

Natural-language understanding, according to Schank, presents some fundamental problems. "The problems

See FIFTH UPDATE/16

Better USE IT
Than Ever for your
VAX

USE IT Better
software
faster

Yes, I want to know how HOS and USE IT can improve software development productivity for my VAX.

- ☐ Please send me information on USE IT for the VAX environment.
☐ Please have a representative call me.
☐ Please send me information on SPEC IT.

Send to:
Higher Order Software, Inc.
2067 Massachusetts Avenue
Cambridge, MA 02140
In Massachusetts call collect: 617-661-6900
Outside Massachusetts call toll-free: 1-800-343-1158.

HOS

Name _____	Title _____
Company _____	Street _____
City _____	State _____ Zip _____
Telephone _____	
Fax/Telex _____	

*VAX is a trademark of Digital Equipment Corporation.

*USE IT is a trademark of Higher Order Software, Inc.

Update

AI technology: Implications for DP

By Howard Dickson
Special to CW

Businesses soon will be able to obtain the decision-making skills of a Fortune 500 manager or a \$1,000,000 consultant by creating an artificial intelligence expert-system software program. How will this and the other subtle aspects of AI affect the data processing manager? With the AI industry just now emerging from the university laboratories and AI products becoming commercially available, the capabilities and potential of AI products are now very real.

AI can be considered as the application of computers to the process of learning and understanding from experience, acquiring and retaining knowledge and responding quickly and successfully to a new situation.

Unfortunately, this definition does not resolve the fundamental problem of obtaining a consistent and complete definition of the word "intelligence." The basic answer, however, is that the capability of AI allows a computer to make human-like decisions.

With a few exceptions, the initial AI products will be in the form of software or software packages with customized computer hardware, such as the following:

- Expert systems — software programs that attempt to duplicate the decision-making process of human experts in a given field, such as geology, medicine, engineering and science.

- Natural language software — programs that allow the user to query the computer and access data in a conversational style as opposed to specific computer commands.

- Visual recognition — software programs and hardware being developed primarily for applications associated with inspection and robotics, allowing a system to discern particular objects, shapes or components.

- Voice recognition — hardware and software programs designed to analyze the sound and identify each spoken word.

- AI computers — hardware that

is specifically designed for AI software and applications; usually symbolic processing.

All of these areas will have some impact on present DP activities. For example, advances in voice and visual recognition and AI computers will start to affect hardware acquisition decisions in the next few years. We now have the possibility of finding limited-range, voice-activated typewriters by 1986. The major technical impacts, however, will be in the areas of expert systems and natural languages.

A primary growth factor for AI in the next one or two years will be the availability of framework expert systems and the realization within the user community of the need for this technology. In some companies this capability has already bypassed the DP department. In one case, the capability of expert system development originated in the research and development department and was transferred directly to engineering — completely circumventing the DP department.

With natural language, anyone will be capable of accessing a data base — if allowed.

What are the factors that will affect the data processing manager? The changes will range from none to complete reorganization. The potential changes for a company will range from the technical to the management level.

And even to social aspects. In the extreme case there will be no need for a DP department and the support specialist. This is most likely to occur in new companies without an established DP department.

With the present trends to powerful desktop computers, natural language interfaces and the resultant "distributed processing" data base management, data analysts (spread sheets) and even word processing can be and are currently performed by individuals in smaller companies.

A natural language interface to a data base allows entry and use without requiring any programming knowledge. For some current products, very little computer operation experience is necessary beyond finding the "on" switch and the ability to read commands on the screen.

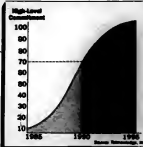
Even the word processing department will not be required. Today,

with a combination of new word processing programs, spelling checkers and form checkers (an IBM program), even an engineer can turn out an acceptable letter. This will be even easier in about two years when commercially viable voice-activated word processing computers become available.

More likely than the demise of the DP department is the trend toward self-programming. AI software, including both expert systems and natural languages, will allow the user to customize the programs to obtain the proper data and desired report forms. Expert systems, once they are developed, can provide information to any inexperienced operator. The results will be, if not the elimination of a staff of specialized programmers and computer experts, then a major shift in the type of skill required.

In a few years, the DP department in a progressive company will not be advertising for Cobol or Fortran programmers. If a programmer is re-

HOW FORTUNE 500 COMPANIES WILL RESPOND TO AI



The amount and cost of equipment required to accommodate the unrestricted load would increase dramatically.

Even without uncontrolled use, the amount of computer equipment will increase. AI programs typically require two to 10 times more dynamic memory to provide their operating intelligence. Most computers dedicated to AI software are 82-bit machines with extended memory capabilities. Lucky for the department's budget, however, is the decreasing cost trend of computers and memory of over 30% per year. This does mean, however, that present equipment becomes technically obsolete in less than five years.

AI programs, including the natural-language data bases and expert systems, can be less accurate than those currently running. For the DP department and the user management personnel who are accustomed to reporting data to "x" decimal-place accuracy, AI programs will require some rethinking.

For example, a good expert system is designed to give "fuzzy" answers. The answers are actually weighted in favor of the probability based on the confidence of the input information. Natural-language data bases — introduce more human-like and the possibility of error as requesting the information from a human. There is the same problem of the correct interpretation of the request or question. For example, take the following conversation with a data base:

Human: Give me the value of PX Computer Sales in New York.
Computer: Do you mean annual sales?

Human: Yes.
Computer: \$10 million.

This information could be completely inaccurate if the user was thinking of New York City when the question was asked and if the natural-language data base had been trained to respond to recognize states. Normally, a good AI program is designed to identify possible misinterpretations, but as the programs become more human-like and are expected to respond as such, the same type of errors can occur.

One industry observer suggested the possibility of stagnation within the DP department. With all of the "artificial" intelligence, the departments will not have to do anything. We assume that this will not be true.

The bottom line is that the DP manager will have to do more managing. With the capabilities of AI on board, the DP manager will have fewer programming and technical problems but will have more management problems, such as more managing, security, equipment selection, program selection, budgets and personnel acquisition.

Dickson is the president of DM Data, Inc., a Scottsdale, Ariz., consulting firm that specializes in artificial intelligence.

Update

FIFTH from UPDATE/14

of language is not language. It's what is behind it," he explained. "It is the inference problem. The inference problem is caused by the fact that what we say is only the tip of what we are really thinking and thus trying to express. The problem is deciding how are you going to teach all this stuff to a computer."

Despite the enormity, and perhaps impossibility, of this task, the market for natural-language software is growing. According to DM Data, when combined as front ends for expert systems, this software is projected to be the fastest growth area of the AI market, increasing at a compound rate of more than 75% per year. By 1990, the company predicts

nearly a \$1 billion marketplace.

Natural-language front ends currently exist for personal computers, minis and mainframes and generally focus on two uses: data base query and software integration. Products range in price from \$400 for IBM Personal Computers and up to \$50,000 for minicomputers. The best-known success story in the natural-language business to date is Waltham, Mass.-based Artificial Intelligence Corp.'s (AIC) Intellect product, a software interface-to-mainframe data base management system.

The company was founded in 1975 by Larry Harris, but the product did not appear until 1981. Written not in Lisp but in PL/I, Intellect runs under DOS/VSE, MVS and VM environments and sells for between \$50,000

and \$70,000. Intellect has been picked up by such software manufacturers as Cullinet Software, Inc. and Information Science, Inc., and in 1983 was given the stamp of approval from IBM.

Other major players include Cognitive Systems, Inc. (of which Schank is chairman), Frey Associates, Inc., Microrim, Inc., Mathematics Products Group, Inc. and YI. According to the Gartner Group, however, none of these products approaches a human understanding of English. All have limitations and will

not accept just any free-form query. This generation of products is also

not portable, as the lexicons that are built in are intimately tied to the underlying data bases.

Today's offerings use such techniques as "fuzzy set" theories, which allow the computer to make a satisfactory decision as opposed to no decision at all, forgiving misspelled words and responding with the nearest equivalent. Heuristics are incorporated into the technology to offset what AI researchers call "combinatorial explosion," a state in which the number of possible alternatives is so enormous that a computer simply cannot handle it — as in chess, for example, where there are approximately 10 to the 150th power legal moves. So programmers build in rules of thumb based on experience to cut down the number of alternatives.

At Yale and at such companies as Cognitive Systems, work is being done on translation methods to well-known software packages. Although the first uncertain steps are being taken in cognitive understanding, it is clear that at least a decade separates today's user from the breakthrough technology required for high levels of natural-language understanding. Work in the research laboratories of universities tends to precede commercial product cycles by 10 years and the next generation of understanding is only now getting under way in academia.

A Schank explained, "We in the field of AI will continue to have, as we work on the problem, spin-offs that relate to people in the information industry to make their lives easier. A great many interesting things will happen. But general AI is about understanding intelligence. And we aren't quite there yet."

IBM: leader or follower?
Unlike in virtually any other segment of the computer industry, the name IBM is not frequently heard in discussions of artificial intelligence. For a long time, IBM was considered in many circles to be anti-AI, a reputation gained by its seeming indifference to the study of this new technology. But as the world's largest computer company, with an annual research and development budget of \$4 billion — more than most other computer makers' annual revenues — this giant powerhouse must be viewed as vital to the interests of any emerging field. Indeed, many in the industry said they believe that to hold off a major challenge from the Japanese in the next decade, IBM must spearhead U.S. efforts in the fifth generation. Ironically, IBM is viewed as anything but innovative. According to Feigenbaum, IBM has historically taken a backseat in major development work. "One might look to DEC for innovation, but I don't remember looking to IBM for innovations in time-sharing or innovative architectures or anything along the board," Feigenbaum stated. "I look for IBM to



Goldstein

All we want is to get our foot in your door.

See an **EXECUCOM** account executive about our outstanding Decision Support System and get your own desktop version — FREE.

How can you lose? Discover how your organization can dramatically increase productivity with **IFPS**®, the world's leading Decision Support System, from **EXECUCOM** — the leading DSS software company. In return, receive our PC version, **IFPS** is the essential tool for strategic planning — perfect for cash flow analysis, budget forecasting and reporting, data consolidation and market simulation. Goal setting. "What If?" optimization techniques and risk analysis features guide and support crucial business decisions.

IFPS can be implemented with a minimum of effort and is supported by on-staff specialists and a toll-free hotline. In fact, it's installed and running in hundreds of major companies across America and around the world.

Read what the experts have to say:

"We've found IFPS to be an extremely flexible tool for use in problem-solving applications. It's also excellent for any kind of long-range planning and decision making. We find that IFPS's response to the tough problems is especially rewarding."

Thomas Dally, Director of Planning Systems
Liberty-Dresser Tool Company

There's much more to **IFPS**. See for yourself. Our account executive will give you a no obligation DSS "checkup" and you'll get your own desktop system — FREE. **IFPS** from **EXECUCOM**. Continuing a decade of excellence in Decision Support. For information on how your organization can easily call Phyllis Shockley at 1-800-531-5036 (in Texas 512/346-4980).

EXECUCOM

3400 West Boulevard
Austin, Texas 78730

EXECUCOM

A GORDON COMPANY

*Requires IBM PC, XT, AT or compatible, 512K MB-DOS.

Update

do something significant later, once it [is] proven that it is a viable technology." Added a report from the Gartner Group, "IBM often leaves the spadework, such as market education and development, to others and then muscled its way up to the bar."

In fact, IBM has been involved, however quietly, with AI research since the 1960s when it developed the classic checkers program and did work on machine translation and automatic theorem proving. Since then, work has been done on an ongoing basis at the company's Thomas Watson Research Center in Yorktown Heights, N.Y., as well as at its Palo Alto, Calif., scientific centers.

Although IBM does not have a specific group devoted to AI research, it has more than 100 people working on AI-type projects such as expert systems, speech recognition, natural language and text processing, Lisp and Prolog, symbolic programming and parallel processing. In fact, IBM announced in February that it would donate \$30 million in equipment and personnel to support the effort at Cornell University headed by Nobel laureate Kenneth Wilson (see story Update/22) to construct a supercomputer using parallel architectures.

In addition, IBM has reportedly developed an experimental 512-microprocessor system called the Yorktown Simulation Engine, similar to the Ultra machine being developed at New York University.

Despite all of its research work, IBM currently offers only two AI-related products — its Lisp/VM, a version of the Lisp programming language that reportedly executes current programming techniques into a 370 time-sharing environment; and A Manufacturing Language (AML), a powerful robotic language used to program IBM robotic systems. A version of AML is available for the Personal Computer.

Although IBM remains tight-lipped about its research projects, it has admitted to development work on a number of AI-related systems. Getting the most attention is the interactive, continuous, real-time monitoring program for the MVS operating system called Yorktown Expert System for MVS operators (YES/MVS) [CW, April 8]. Monitoring and management of large systems like IBM's 370 require that problem-solving be done in real time, a task becoming increasingly complex as DP installations and computer applications grow. YES/MVS is an expert system that can essentially perform automatically tasks performed by computer operators. Currently, YES/MVS can perform about two-thirds of all operators' non-manual functions. It can respond automatically to conditions in the system and summarize them.

Although IBM has been deluged with requests for the system, YES/MVS is still in the prototype stage and is not ready to be announced as a product.

In addition to YES/MVS, IBM is working on several other prototype systems includ-



Darpa's autonomous land vehicle will be ready for initial testing in Denver in the beginning of May.

ing the following:

■ **Transformational Question-Answering System (TQA).** An outgrowth of early work in natural-language translation, TQA was designed for querying relational data bases in English.

■ **Epistle.** An natural-language expert system that can check spelling, grammar and style with applications such as summarizing electronic mail.

■ **Scratch pad II.** This system, under development for eight years at Yorktown Heights, contains extensive facilities for symbolic mathematical computation.

■ **Prism.** A project from the Palo Alto scientific center, Prism (Prototype Inference System), is an experimental shell — a general-purpose development tool for expert systems.

■ **PSC Prolog.** Developed by the Palo Alto scientific center, this programming language operates on IBM 370s under the VM/CMS operating system. ■ **Handy.** A user interface containing many of the elements required to allow work between end users and AI systems.

Darpa's computing project

"The battlefield is no place for humans," someone once noted. Ironically, the military tends to agree, and toward that end, the Defense Advanced Research Projects Agency (Darpa) launched its \$600 million strategic computing project in 1983. The military has long been the leading fin-

ancer of innovative academic research in computing, and this latest plan is considered the biggest boost toward the fifth generation.

Although Darpa's initial thrust calls for the creation of three specific defense projects — the autonomous land vehicle (ALV), the pilot's associate and a battle management system — the research and development that surrounds these massive ventures will encompass virtually every aspect of fifth-generation computing.

The plan calls for transcending today's computer capabilities by a quantum jump. Powerful computers will be developed, driven by expert systems, and the machines will be equipped with sensory and communications modules enabling them to hear, talk, see and act on information and data they develop or receive. "This new technology promises to increase our national security greatly," the Darpa press announcement reported.

Although academic and industrial researchers tend to downplay the romanticized science fiction images of intelligent machines, the Strategic Computing project inevitably conjures visions of Star Wars technology.

Battles of robots, driverless vehicles, sophisticated and intelligent fighter planes and weapons with the predatory instincts of animals are all represented in Darpa's ambitious plans.

The military, however, has taken a pragmatic view as well. By providing the weapons to academia and industry through grants and contracts, Darpa is hopeful that the strategic computing project will effect a widespread technology transfer, allowing any and all advances to move into much-needed development in the private sector.

Backed by massive defense spending, the plan's original \$600 million figure will more than likely exceed \$1 billion before the initial project is finished.

According to Clinton W. Kelly III, director of Darpa's engineering applications office, the program seeks to develop a technological base that can be incorporated into new weapons systems.

"Our mission is to do the high-risk research that most of the individual services will not undertake because of the cost," Kelly explained. "We're chartered to always be at the leading edge, to push the frontiers out," he said.

The payoff, Kelly pointed out, must be correspondingly high — a 10 times improvement over current technologies. And the leading-edge components of the program attract most of Darpa's interest. "Computing, up until a few years ago, was incorporated into military equipment as an afterthought. Now, it has reached a level of sophistication and capability where it can't be an afterthought anymore," Kelly said. "It has to be part of the integral design of a system."

"There are a lot of computer-based systems out there that do certain things quite well in anticipated environments," Kelly added. "But if the environment changes, the systems are not intelligent enough to adapt."

Kelly was quick to point out that Darpa's function was not to develop weapons but a technology base that the individual services can exploit for weapons development. To this end, three major projects have been initiated.

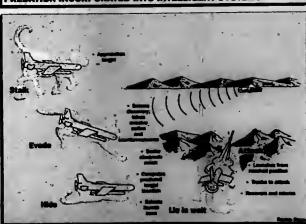
Autonomous land vehicle

This first project, initiated prior to the formulation of the strategic computing plan, is part of an overall design for autonomous systems, such as unmanned aircraft, submarines and land vehicles. According to initial requirements, the ALV will be able to navigate cross-country, plan its route from digital terrain data and update its plan as its vision- and image-understanding systems sense and resolve ambiguities between observed and stored terrain data. Its expert local-navigation system will devise schemes to ensure concealment and avoid obstacles as the vehicle purges its mission.

According to Kelly, the vehicle already exists and is set for initial testing at the end of May in Denver. In its first test, the vehicle is expected to move at 6 kilometers per hour, increasing to 10 kilometers per hour by November. "That doesn't sound very fast," Kelly said, "but you have to keep in mind that that is 12,000 times) better than anybody has done before."

See FIFTH UPDATE/19

PREDATION INCORPORATED INTO INTELLIGENT SYSTEMS



Update

Esprit crucial to European technology

By Kenneth H. Sanderson
Special to CW

With 442 proposals to develop from the European Commission's (CEC) Strategic Technology Programme for Research in Information Technology (STREP) under this year's annual funding of \$180 million, the success of Europe's ability to carry out its major scientific project — as well as the long-term survival of one of Europe's European member industry. Development of technology development — must beyond the limits of Europe's own ship R&D.

will have to be received if Europe's technology development is to remain competitive in the 1990s.

Projects approved this year will cost about \$180 million, with a matching sum contributed by the participating organizations. Planned work and the number of projects include the following:

- 1. Software technology — 14.
- 2. Advanced information processing (artificial intelligence) — 32.
- 3. Other systems — 22.

See UPDATE/19, 20, 21

Now Available from Alslys COMPUTER AIDED LESSONS ON ADA^{*} A Cost-Effective Two-Volume Course For Programmers

This comprehensive course in Ada Programming is designed for those with some programming experience in other computer languages. The course, constructed with the participation of key members of the original Ada language design team, provides a core of Ada concepts using modern techniques of software engineering.

LESSONS ON ADA is self-paced, with color-enhanced exercises throughout each lesson interactively evaluated and validated for each student. It runs on readily available IBM PC and IBM PC/XT equipment and an additional color monitor.

The lessons in Volume I cover Ada Program Structure; Types and Enumeration Types; Integer Types; Boolean, Character, and Real Types; Constraints and Subtypes; Subprograms; Packages and I/O Basics; Composite Types; Statements; Unconstrained Array Types; Discriminants; Access Types; Overloading; Visibility and Context Clauses; and Derived Types.

LESSONS ON ADA, Vol. II, deals with advanced Ada concepts including parallelism and rendezvous, real types, generic units, exceptions, select statements and others.



Providing Ada Language Products

Alslys, Inc., 1432 Main St.
Waltham, MA 02154 (617) 880-0030
In Europe:
Alslys S.A., 28, Avenue de Versailles
78170 La Collette-Saint Cloud, France
33(1)886.12.44

Also Available from Alslys ICHBIAH, BARNES & FIRTH ON ADA^{*} A 27 Video Cassette Seminar Led by the Principal Designer of the Ada Language

This comprehensive 18 hour program includes language examples and other key points illustrated by over 1200 computer-generated color graphics. It is a standard reference work providing an in-depth introduction to the new ANSI/Standard language, intended for technical managers, engineers, and programmers.

Subjects covered include an Introduction; A Simple Program; Types; Subtypes; Composite Types; Arrays and Records; Discriminants; Names, Expressions, Statements; Subprograms; Access and Derived Types; Numeric Types; Program Structure including Visibility Rules, Packages, Private Types, Use Clauses and Separate Compilation; Tasking; System Dependent Programming; Exception Handling; Programming with Exceptions; Generic Units; Programming with Generic Units; Input-Output; Conclusions; and questions from the audience, both technical and general.

FREE (for 30 days, to Training and Ada Program Managers)

- ☐ 20 Minute Preview Tape of Icbiah, Barnes & Firth on Ada.

FREE (for 30 days, to Training and Ada Program Managers)

- ☐ Demonstration Diskette of LESSONS ON ADA

Name

Title

Company

Address

Telephone Ext.

Alslys, Inc., 1432 Main St.
Waltham, MA 02154 (617) 880-0030
In Europe:
Alslys S.A., 28, Avenue de Versailles
78170 La Collette-Saint Cloud, France
33(1)886.12.44

Soviets' AI research takes shape

As the U.S., Japan and Europe gear up for the fifth generation, what is happening in the Soviet Union?

Though it is difficult to gauge how far the Soviets have come in computing technology, it is generally agreed that they lag far behind the U.S. and Japan in many emerging technologies.

According to retired Adm. Bobby Ray Inman, head of Austin, Texas-based Microelectronics and Computer Corp. (MECC), the Soviets have developed, within heavy industries that support defense, a pretty good capability in taking Western technology and adapt it to their own needs. They have been far less successful in creating new technology of their own.

Henry Friedman, a consultant, and Gabriel Johnson, an AI researcher with GTE Corp. Laboratories in Waltham, Mass., are Soviet Jews who emigrated to the U.S. in the early 1960s. Both Friedman and Johnson were deeply involved in AI research in the Soviet Union. Friedman, in fact, started the first laboratory devoted solely to AI research there in 1974.

Though both men were forced to discontinue work in the field when they applied for emigration, Johnson

See UPDATE/22

FRANZ THE FIRST NAME IN LISP

Franz Lisp from Franz Inc. is currently available on a wide range of machines under UNIX and VMS. Franz sets the standard for Lisp. Call or write for more information:

Franz Inc.
2820 Domingo Ave.
Berkeley, CA 94705
(415) 840-1224

* Ada is a registered trademark of the U.S. Government (AFIPS)

Update

FIFTH from UPDATE/17

By 1988, after initial road-following techniques are perfected, the ALV will begin cross-country navigation. Concurrent with work on the ALV is the development of a walking machine capable of maneuvering over virtually any terrain.

Among the more ambitious goals for the ALV and the walking machine is to eventually incorporate the behavioral patterns of lower mammalian animals as they sense and react to threats as well as predation. Kelly said he is hopeful that the vehicle will be an analogue to interesting behavioral patterns in the animal world, such as the panther stalking its prey (see chart UPDATE/17).

Battle management system

A second Darpa project — the battle management system — is aimed initially at naval aircraft carrier groups and is based on a multiperson, multiproblem paradigm. This system will be designed to help teams responsible for managing large-scale, fast-paced combat situations fuse information, generate options, make decisions and monitor events.

The contract for the system was awarded to Texas Instruments, last December and will face a twofold approach, according to Kelly. On the one hand, expert systems will have to be developed to handle extraordinarily complex problems created by many contingency assignments that involve large numbers of men and ships in tense, war-time situations.

In addition, there is the problem of communicating at the front and back ends of the system, Kelly explained. Senior officers and staff will not want to use complicated command sets and exotic languages to communicate with the system, so a natural language and speech-understanding front end and similar back end will be required so that results will be offered in English.

Pilot's associate

The third project is the pilot's associate, whose objective is to create a phantom crew in the cockpit of an aircraft that will help the pilot fly and exploit various weapons systems and defensive systems on board. The prime motivation for this project (which has yet to award a prime contractor) is the increasing complication of aircraft. "Not only can the pilots cope with the tremendous flow of information that's coming in as it is currently displayed to them, but they lack both the mental and physical abilities to extract from the airspace all it is capable of providing," Kelly explained.

The system will enable a pilot to off-load lower level instrument monitoring, control and diagnostic functions, freeing the pilot to focus on high-priority decisions and actions.

Kelly said he believes this capability is deliverable by the 1990s.

Although R&D work has been passed on to a long list of universities, research labs and corporations, Kelly said he is concerned that technology transfer goes beyond specific work on the military applications. He pointed out the implications of the battle management system for use in air traffic control, the pilot's associate for the commercial airline industry and the ALV for work in robotics.

Surprisingly, Darpa is anything but secretive about its work for this reason. Kelly said individuals and research groups are consistently being invited in to learn firsthand about the ongoing work. "We've run into occasional national security problems, but to the extent possible, we want to pump this technology out into the industrial base."

As the Strategic Computing program evolves, anticipation of its pay-offs is high. Kelly tempers the enthusiasm with real-world pragmatism. "To my way of thinking, the ultimate impact of these kinds of technologies will be determined by how inexpensively you can deliver them," he insisted. "It's fine to talk about a missile system with all those capabilities, but if you can't deliver it

for a very low cost, you don't have very much."

Fifth-generation projects are under way at more than 70 universities and many research laboratories and corporations. A broad expanse of technology is being developed covering a wide range of applications. Projects once considered impossible are in prototype stages, including advanced vision systems, speech and voice recognition systems, computer-aided instruction systems and computer-aided design and manufacturing systems incorporating both AI and advanced robotics.

The work is made more exciting and tantalizing to both "techies" and

humanists because it encompasses and irreversibly intertwines many diverse disciplines such as philosophy, mathematics, humanities and the arts, computer science, psychology and linguistics.

At MIT, MIT has been at the forefront of AI research since the discipline was formulated in the mid-1950s. AI pioneers such as Joseph Weizenbaum, Marvin Minsky, Patrick Winston and Randall Davis have led MIT's efforts to move AI from a set of intellectual academic theorems to real systems with practical pay-offs. A spate of MIT alumni have spawned commercial ventures using technologies that were developed and refined at MIT's Artificial Intelligence Laboratory.

See FIFTH UPDATE/23

Computware Case #4

(You and)
CICS
Abend-AID
VS.
The Bump

Exhibit A.
The Irate Boss.

You need a better defense against transaction abuse.

Would you rather face an irate boss who is aggravated because of programming problems, or one who's all smiles because "all systems are go"? Thanks to CICS Abend-AID, from Computware, debugging is no longer a problem, and what boss wouldn't appreciate that! This powerful software tool works hard solving transaction abuse, so you can devote more time developing applications instead of debugging them.

Computware CICS Abend-AID supplies the proof. It's like having your very own full-time problem solver to analyze the cause of transaction abuse and let you know instantly what happened, why it happened and where it happened—all in plain English. And it even tells you how to correct the problem as simply as possible.

Put the advantages of Computware CICS Abend-AID into practice immediately.

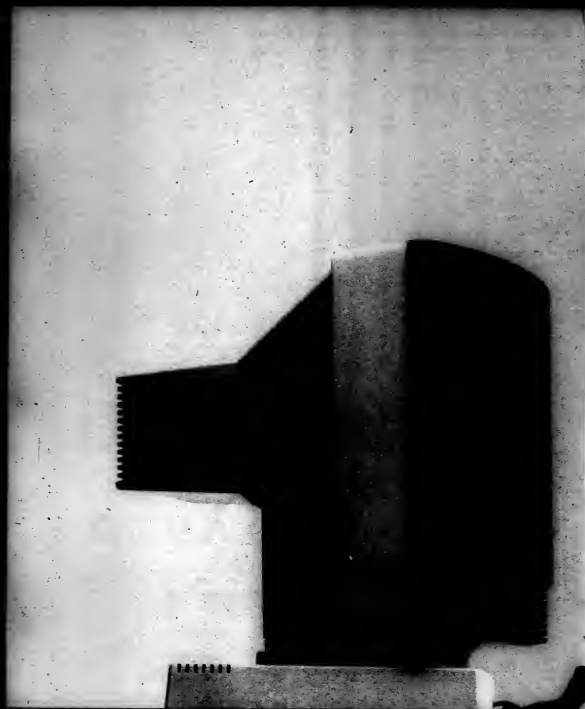
Haven't you lost enough production down time? And wouldn't you like to spend more of your time developing programs? That's the probable way to do business and keep the boss smiling. You be the judge.

Get Computware CICS Abend-AID a fair trial for 30 days, free of charge, and discover its immediate time-and-money-saving benefits—not to mention a happier boss!

Call 1-313-540-0400 today, and Computware will take it from there. With Computware CICS Abend-AID debugging your case, you'll win the boss over every time.

COMPUTWARE

32000 Telegraph Rd.
Birmingham, AL 35202
(313) 540-0400



One new terminal offers exceptional reliability through advanced technology.

The new TeleVideo 955.

This begins a new generation of superior quality machines from the world's number one independent terminal maker.

At its heart is an incredibly hard working custom microchip that has permitted us to eliminate many of the components found in other less advanced terminals. And many of the problems they caused.

So the 955 is a more reliable terminal which promises less down time and remarkably low cost of ownership.

What's more,

this is the first TeleVideo terminal to be warranted for one full year.

950 Family compatibility.

The 955 works with our extremely popular 950 Family standard and offers two sets of 32, a total 64, function keys you can customize with ease. As well as definable scrolling regions.

This is the only terminal with easy upgrade flexibility built right in. And up to four pages of display memory at 80 or 132 characters.

Its comfortable new keyboard has earned twice the reliability rating of earlier models.

Improved pinpoint resolution.

Advanced technology is also responsible for

a high contrast, 14 inch screen (amber optional) that's dramatically easier to read than the ordinary CRT.

And we've even succeeded in putting all these helpful advantages into a terminal that occupies far less desk space than you would imagine.

The new TeleVideo is \$699.

The new 955. Unequaled value from a terminal company with the experience and resources to be your single source for guidance, hardware and support.

Call (800) 521-4697 or, in California, (800) 821-3774. Ask for Operator 7. See the machine engineered to leave no doubt about TeleVideo's pre-eminence in the terminal business.

The logo features a stylized cube icon to the left of the word "TeleVideo" in a bold, sans-serif font.

COMDEX Booth III14

Terminal

Atlanta/Santa Ana (714) 476-0244, California/Sunnyvale (408) 745-7760, Georgia/Atlanta (404) 447-1231, Massachusetts/Boston (617) 890-3282, New York/New York (516) 496-4777, Texas/Dallas (214) 258-6776.

Update

WILSON from UPDATE/7

puters and will be upgrading them quickly. The bulk of the market will lie in the low end (machines priced at several hundred thousand dollars), but installations at all price levels, including over \$100 million, will exist.

■ Supercomputers will be closely integrated with three-dimensional optical graphics. The desire for real-time graphics displays (60 frames per second) of the progress of three-dimensional simulations will create an extraordinary demand for supercomputer upgrades and other technological advances. Real-time graphics of this sort requires roughly 100,000 times the performance of current supercomputers. This performance level will not yet have been reached in 1990 but will be close enough so that pressure to reach it will be immense.

■ A flowering of scientific, technological and artistic endeavors will accompany the increasing power of supercomputers. Virtually all graduate disciplines in such fields as science, engineering, biology and medicine will be making essential use of supercomputers.

■ Supercomputers will be playing major roles in industry. They will be used throughout the U.S. industrial base — in chemicals, oil, aerospace, glass, photography and image processing and high technology — to shorten product development cycles and help engineers achieve new levels of product optimization with respect to low cost, high quality and environmental compatibility.

Industry-university joint efforts will increase rapidly as cooperation between basic university research and industrial applied research becomes more and more fruitful.

All of the predictions I have made for 1990 are based on trends visible today. For example, all of today's supercomputer manufacturers moving to incorporate parallelism into their designs.

Today a supercomputer market is small because of the multimillion-dollar price tags on supercomputers. There is a huge untapped vacuum for a line of supercomputers that can be assembled and then upgraded step-by-step in \$100,000 increments, fitting in well with the present multimillion-dollar supermini market.

Today, in forefront computer graphics efforts such as those at Don Greenburg's Center for Computer Graphics at Cornell University, it often takes eight hours of supermini-level processing to

produce a single graphics picture. Further processing power is required to generate a single graphics picture from a three-dimensional simulation.

Few such simulations are attempted on current equipment. No one familiar with the processing power needed to support graphics will be surprised by the estimate that a machine 100,000 times as powerful as a Cray supercomputer would be required to support real-time graphics.

Throughout the graduate programs at Cornell and around the country, students work on a thesis project, attacking the most complex problems in their disciplines. Supercomputers are designed to

turbulent flow of gases and liquids and the precise nature of the chemical bonds that bind atoms in molecules. Both of these problems recur in many scientific disciplines and technological applications; both are of multibillion-dollar importance to industry; and both are major unsolved problems of scientific research of over 50 years' standing.

In 1990, a major effort pushing supercomputer technology to its limits will likely occur in order to make progress on these problems.

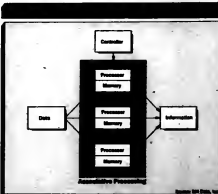
By then, supercomputers in universities should be widely distributed among departments and individual faculty members, just as superminis are today. However, in the meantime, the strong supercomputing programs already in existence at Cornell and the University of Illinois should play a major role in moving from the current era of expensive vector machines to inexpensive parallel machines.

An intense but friendly competition should develop between these two universities to be the first to achieve major breakthroughs in parallelism. Each university will be working with industrial partners — Illinois with Cray Research and other companies and Cornell with IBM, Floating Point Systems, Inc. and others.

Finally, in 1990 the U.S. will likely face more intense international competition in supercomputers than it does today. Over the last 10 years, the major Japanese manufacturers, such as Fujitsu Ltd. and Hitachi Ltd., have risen from scratch to develop supercomputing products competitive with the best the U.S. has to offer.

The Japanese manufacturers have formidable resources at their disposal to continue supercomputer development. I believe that the U.S. can gain a temporary edge if it moves rapidly into parallelism, but foreign vendors will prove hard to catch up. Competition will intensify as it becomes clear that a multibillion-dollar market is at stake.

Dr. Kenneth G. Wilson, a 1952 Nobel laureate in physics, teaches at the Floyd R. Newman Laboratory of Nuclear Studies at Cornell University in Ithaca, N.Y. He was recently named director of the new National Advanced Scientific Computing Center at Cornell. Among the center's first major ventures is a joint development project with IBM on a new architecture for supercomputers.



handle precisely this complexity.

Complexity arises when a planetary scientist wants to understand Saturn's rings, which contain thousands of rocks, instead of the simpler problem of one planet circulating the sun. Complexity arises when an automobile engineer tries to understand the turbulent flow of air underneath an automobile, including every swirl and eddy past the tires and oil pan, instead of just smooth airflow past a perfect sphere. Complexity arises when an economist studies a regional economy of many different sizes of towns and factories instead of just overall gross national product figures.

Beyond this, there are two areas of scientific and engineering inquiries of overwhelming importance and equally overwhelming difficulty: the

USSR from UPDATE/18

son continues to track AI activities in the Soviet Union through his former ties.

According to Jakobson, fundamental AI research in the Soviet Union compares to work being done here, but applied research is not state of the art. On the other hand, he pointed out that the strong Soviet tradition in mathematics research has encompassed work in linguistics and natural language development.

Despite its deficiencies in AI hardware, the Soviets have begun to respond to the fifth-generation call, and work is spreading rapidly.

According to Jakobson, the Soviet Academy of Sciences has an academic computing center in Moscow studying AI and natural language processing. "The Soviet Union is a huge country, and hundreds of people are working on AI research," he said. "They can concentrate their efforts very quickly and get results."



Innovation

**FIND OUT WHY
THE BEST MINDS
IN SOFTWARE
TECHNOLOGY ARE
LOOKING TO
LOCKHEED-AUSTIN.
AND THEN
GET YOUR RESUME
READY.**

See our ad in the
classified section.

Lockheed-Austin
Giving shape to imagination.

CITICORP • TTI

Citicorp/TTI, an innovator of advanced systems for Citicorp, is leading the research and design of the electronic systems of tomorrow. We are currently seeking qualified candidates for the following position:

Artificial Intelligence

Assume a leadership position in the field of Distributed Expert Systems. Provide technical expertise and awareness in knowledge engineering methodologies to determine their potential utilization within Citicorp. We require an advanced degree in Computer Science or equivalent, with specific experience in Distributed Processing, Lisp and the UNIX™ kernel. Knowledge of state-of-the-art Natural language processing highly desirable.

We reward our employees with an excellent salary and a comprehensive benefits program. For immediate consideration, please send your resume, or call:

CITICORP • TTI

Click Case
Department
3000 Ocean Park Blvd.
Santa Monica, CA 90405
(310) 459-9811

A subsidiary of CITICORP •

Equal Opportunity Employer M/F/H/V
Citicorp is an Equal Opportunity Employer

Update

BLOOM COUNTY



by Boris Brodsky



FIFTH from UPDATE/19

Winston, currently director of MIT's AI lab, has written several noted books on AI and is deeply involved in research on computer learning. With the recent flood of interest in the commercial possibilities of AI, Winston has seen the conflict firsthand.

"Whenever a field catches the public eye as AI has, there's bound to be a certain amount of tension between people of varying dispositions," Winston said.

Winston admitted that the search for top-notch AI researchers is getting tougher as the large salaries from industry have begun to lure them away. "Sure, we've lost a few people who we would have preferred to keep, and I'm speaking more in terms of the field than just MIT," he said. "But a few people have left research to go into the field and work on proprietary commercial products. From one point of view that's unfortunate. But from the other side, it's a sign of the maturing of the field."

With large grants from Darpa as well as significant corporate contributions of money and equipment, MIT remains able to focus on its many research projects. The AI lab has major commitments to work in robotics, which encompasses computer vision, manipulation and the connection of perception to action. It is also at work on "deep" expert systems, which Winston described as those deriving beyond existing expert systems technology into models that reason and employ problem-solving paradigms that are not rule based.

In addition, a wide range of smaller activities are under way: computer learning, natural language, common-sense reasoning, parallelism (the lab is at work on a prototype of a machine with one million processors) and the development of basic theories on intelligence.

Although only a few feeble attempts at commercializing computer learning have been made, Winston said he is pleased to see interest in the area begin. The idea of creating a computer that will teach itself is not new, but it remains among the most difficult problems to solve. Winston's work at MIT is currently integrating computer vision work in hopes of creating a prototype that will learn about the world by looking at it and thinking about the functions it will perform.

"In the next 10 years, we will see learning emerge as an extremely important characteristic of commercial systems because the world is too complex to spoon-feed computers everything they need to know," he said. The fundamental problem blocking AI work at MIT and elsewhere, according to Winston, is the shortage of people who can do truly outstanding work in this difficult medium. "Our primary limitation is that there are only a few 'universe-class' people who are likely to shift our paradigms," he said.

■ Digital Equipment Corp. DEC, the Maynard, Mass.-based minicomputer giant, has had a long and rewarding relationship with the AI community. Its minis continue to be a popular choice for AI development work. The company spends heavily in support of AI research at universities, and in 1979, DEC began using an expert system internally with the advent of the Xcon system.

Xcon is perhaps the most well-known industrial AI success story to date. The system, refined by John McDermott at Carnegie-Mellon University, is now an integral part of DEC's manufacturing facilities, configuring any VAX and PDP-11 order. The success of Xcon has spurred development of layered add-ons called Xael and Xaitz. Xael is a

customer. Once a system configuration is completed, Xaitz can be used to do site preparation work.

According to Arnold Kraft of DEC's AI marketing group, those three systems are the largest expert systems in use in industry today. DEC has not stopped there, however, more than 20 additional applications are under development for internal use. Despite its success thus far, DEC does not offer its expert systems for sale. "We share the names and details with our customers, but it is only to let them know what we are doing and give them the courage to proceed on their own," Kraft said.

Kraft pinpoints DEC's success in the emerging AI world as the ability to combine commitment to innovation with a pragmatic understanding of the real world. "There are a lot of problems out there that still haven't been touched, and AI will help a great deal," Kraft said. "But the people out there with the problems are in real-life situations, and they don't want to replace everything they've done in the past — their software libraries or their manual procedures. They would like to complement what they have. I believe those are the people who are going to succeed first in using AI."

■ Microelectronics and Computer Technology Corp. (MCC), as the rush toward advanced computer technologies increases, the quest for R&D in a variety of areas has launched a spate of consortiums around the country. MCC in Austin, Texas has made among the most widely publicized and ambitious efforts. MCC, independent and for-profit, was founded by a group of industrial corporations such as DEC, CDC, NCR Corp., Sperry, Gould and others as a direct response to Japan's announcement of its ambitious fifth-generation computer project.

It has become increasingly clear to American industry that it is extremely difficult for any one corporation to handle the scope of R&D necessary to keep this country in the forefront of technological advancement, especially with Japan's unrelenting charge toward the same world markets.

Thus, MCC offered a way for companies to hedge their bets while bringing together top-flight talent and resources for high-risk research. Rather than turning to government, MCC's founders decided that a private consortium offered a more effective way to pool resources.

When it began operation in January 1983 under newly selected Chief Executive Officer Bobby Ray human, a retired admiral, MCC initiated four major development areas: advanced computer architecture, packaging and interconnect technology, software technology and very large-scale integration CAD. Under the advanced computer architecture group are four subgroups: hardware, software, parallel processing and data base. Member corporations or shareholders purchase a share of MCC and must join one or more of the four programs for which they contribute funds and personnel.

At present, the general idea of the plan was that it allowed companies to focus on long-term problems without bringing in current proprietary

sales representative's assistant, insensitive and friendly, which incorporates all of Xcon's knowledge but helps the sales representative configure and sell the system to the

technologies. By working in areas where none of the shareholders had significant prior efforts, a company could invest \$10 million and, in 10 years, have received \$100 million in research.

MCC has nearly 300 employees — 60% of whom are direct hires — and 20 member companies. Because of the long-term nature of its work, MCC will not discuss any of its specific projects or additional planned ventures. "The U.S. as a whole will remain competitive with the Japanese, and MCC is going to contribute to that," human said. "There may be some surprises, some early deliverables in areas like software, production of software, data base management and human interface. The gain in AI and parallel processing are likely to be farther out."

Despite its lofty goals, MCC has run into obstacles. The problem of having some companies participating in one discipline but not another has raised questions about the viability of technology transfer. Also, its proprietary nature makes it difficult to view MCC as a national resource aimed at countering the Japanese.

In addition, Gordon Bell, vice-chairman of Encore Computer Corp. and a leading proponent of the formation of MCC, said that such projects and corporate America in general are missing the most significant point. "There is sort of an intellectual pecking order here which has science first, engineering second and manufacturing third," Bell said. "And by the time you get to manufacturing, there aren't any smart people left. What it amounts to is that we really can't make things anymore."

The outlook

Ten years may be a lifetime in the traditional computing industry, but artificial intelligence represents a step beyond tradition. Though the continued miniaturization of technology in both size and cost promises to extend the horizon line of the fifth generation, it also promises a more aggressive push, the quantum leap forward for AI clearly remains 20 to 30 years out.

According to Morley and Taylor of Gould, a flying bumblebee and a Cray supercomputer are comparable in computational energy. The bumblebee and the Cray computer process the same number of bits per second, but hardware, they pointed out, is not nearly fast enough for human emulation. Despite this, researchers continue to pursue machine intelligence on many levels, using a variety of overwhelming odds or the

seeming impossibility of imagined goals. The march toward the fifth generation may see breakthroughs in paradigms, or it may continue to be a tugging, evolutionary process. A 10-year period, experts agreed, is simply not enough to expect to see a revolutionary type of change.

MIT's Winston views the future as a staircase. Knowledge accumulates on one step for many years without any commercial use, until all of a sudden it gets used voraciously, and the technology moves up a step. "This will happen in AI," he predicted. "Systems will not change much for 10 years, then suddenly there will be a revolution. New paradigms will be rapidly incorporated into commercial products."

According to Stanford's Peigenbaum, in 30 years the effect will be dramatic. Knowledge, he pointed out, will be viewed as a different way than today. It will no longer simply reside in books; it will be on-line and will be accessed by need in the concept of the living library, a library responsive to a user's needs.

"These tools," Peigenbaum stated, "will become active agents, intellectual aides to a great deal of our routine business, industrial, engineering, scientific and financial way of thinking."



Winston

Update

ESPRIT from UPDATE/18

- Computer-integrated manufacturing (CIM) — 19.
- Advanced microelectronics — 28.

A prerequisite for Esprit funding is that at least two industrial organizations from separate EEC-member states be involved in a research effort.

The result is that 270 companies, universities and research institutes are represented in the first year of the program's main phase. The majority, naturally enough, are based in the UK, France and West Germany. Among private-sector participants, 50% of all projects involve small firms.

It is clearly too early to gauge the

quality of the work that will emerge from the Esprit projects. The research covers a wide array of advanced technologies and the participating organizations seem to have many of their good people involved.

From a European's vantage point, fifth-generation computers may offer Europe its last chance to build a domestic computer industry. U.S.-based companies today supply about 45% of Western Europe's information processing equipment. Japanese vendors, though now providing a considerably smaller percentage, are making significant inroads into the European market.

European computer makers, though fortified with ample re-

sources and a home market potentially larger than that of the U.S., have fared unimpressively, with some requiring state subsidies and protective measures to carry them through hard times. What's more, as the march of technology shortens product life cycles and demands larger amounts of capital to remain competitive, European companies are joining forces with Japanese vendors, or in the case of Olivetti Corp., with AT&T, to battle the giant of European computing — IBM.

This is an opportunistic and usually successful short-term policy. However, just as the Japanese vendors will eventually shed their American partners (or absorb them) to attack the U.S. market directly, a similar pattern will follow in Europe. Esprit,

it should be noted, is by no means the only research and development effort aimed at developing a European fifth-generation. The Alvey program, the UK's \$400 million fifth-generation project, has been under way for two years. Smaller government-funded efforts are moving ahead in France and West Germany. In addition, many of the large computer firms and many large end users are funding AI research projects.

On the positive side, there seems little doubt that the Europeans are capable of making important and potentially marketable contributions to next-generation systems.

In addition, European banks and insurance companies, which will be among the first users of expert business systems, appear at least as open at this point to bringing the new technologies into their businesses as are their American counterparts. This should provide European AI vendors with good testing grounds and, eventually, more eager customers.

Unfortunately, the problems facing Esprit are numerous. Simply coordinating work across long distances and coping with differences in language, corporate cultures and corporate strategies will be difficult, despite the relatively limited scope of the program. Esprit projects, it must be noted, are limited to precompi-

Announcing Update, the new technology & management section of Computerworld

You're reading the premiere issue of *Update* — the new section of Computerworld which will appear in the first issue of each month. In the months ahead *Update* will provide our readers with comprehensive analysis of future technological developments, as well as current management issues. Developments and issues that are vital to our readers' organizations and careers.

We'll explore the breakthroughs that are coming in computer technol-

ogy during the next three to five years — in order to help MIS/DP managers plan for the future. Plus we'll review management theory and practice — in order to help MIS/DP managers deal effectively with their personnel resources.

This month we're exploring The fifth-generation push. Next month, in the June 3rd issue of *Update*, we'll focus on...

Recruiting and Keeping a Professional DP Staff

We'll interview a leading recruitment executive. Take a look at how to keep employees up-to-date on the latest technologies. Explore the special problems involved in recruiting and keeping women professionals. And find out how MIS/DP managers replace key people with succession planning.

Plus we'll examine these important questions... Are colleges turning out enough qualified people? Is it better to develop a staff in-house, or recruit

from outside? How can an employer make a good technician "user-friendly"? And how can companies fight off personnel raiders?

Reserve space for your ad today. The space close for the June 3rd issue, is May 17th. Call Ed Marecki, National Sales Director, at (617) 879-0700. Or call your local Computerworld representative.

Space close: May 17

On the positive side, there seems little doubt that the Europeans are capable of making important and potentially marketable contributions to next-generation systems.

tive research.

It will be at the development stage and beyond, however, that more substantial problems will surface. After all, Esprit will be meaningless if the results of its research cannot be translated into products and jobs. Among other inhibitors to growth are the following:

■ Little venture capital is available to European start-ups that might produce and market Esprit-derived technology.

■ European AI managers are far less open than their American counterparts to purchasing from small, unproven vendors — and the same goes for European governments.

■ Relations between private companies and leading research universities, an increasingly important factor in the U.S., remain very poor in Europe despite the step forward that Esprit represents.

Given the long list of challenges facing the European computer industry over the short- and long-term, it would not be surprising if, as with today's technology, Europe ends up importing much more of the fifth-generation technology than it exports.

Somewar is director of artificial intelligence research at the Gartner Group, Inc. in Stanford, Conn.

COMPUTERWORLD

Business (617) 879-0700 Chicago: (312) 827-4433 New York: (201) 967-1330 Atlanta: (404) 394-0752
San Francisco: (415) 421-7330 Los Angeles: (714) 261-1230 Houston: (713) 953-1220



New partners in information

By Harvey Poppel

Within the past two years, once-iconoclastic IBM has affiliated with such diverse partners as Sankyo-Seiki, Sears Roebuck & Co., Merrill Lynch & Co., CBS, Raim Corp., Intel Corp. and Stratus Computer, Inc. AT&T has struck deals with United Technologies Corp., N.V. Philips, Electronic Data Systems Corp., Convergent Technologies, Olivetti Corp., Ricoh Co. and Japan ENS. General Motors Corp. has acquired EDS.

In just one year, from 1982 to 1983, information industry acquisitions zoomed 31% vs. an average in all other industries of 4%.

The underlying rationale is compelling. Information industry corporate planners are seeking sustainably higher returns on their shareholders' equity (ROE). They have come to realize that the underlying trade-offs to growing ROE have tilted away from internal development and toward external

IN DEPTH/PARTNERS IN INFORMATION

development. True, internal development still has its advantages. Most important of these is control. Research and development teams can be focused on specific targets, and funding apogees can be opened up or closed down.

In many instances, internal developers can continue the pace of commercialization and the degree of conformity with industry standards. The resultant product and service can be highly proprietary or open for others to share and leverage. Moreover, internal developers are bred from the same corporate culture and pool the benefits of cumulative experience for their corporations.

But many companies that have relied solely on internal development have been frustrated by their inability to keep up with, much less exploit, the accelerating pace of information technology and marketplace dynamics.

Infotrends

There are five fundamental, yet interrelated, forces — "infotrends" — that drive external development.

An emphasis swings from the mass marketing of generic facilities to the specialized, often vertical marketing of content-differentiated products, the available R&D dollars and talent are spread too thin to satisfy all (or any) development imperatives. As a result, hardware and telecommunications firms, previously vertically and horizontally integrated, are seeking content-led partners.

For example, Wang Laboratories, Inc. has begun to take positions in data bases related to document preparation (including the exclusive electronic publishing rights to the *Random House Dictionary and Roget's International Thesaurus*). Apple Computer, Inc. and most other computer manufacturers are increasingly cultivating value-added resellers with differentiative applications software through co-marketing arrangements and even, in some cases, financial and technical support. Local telephone companies and value-added network carriers are encouraging interconnections and joint marketing of audiotext and other electronic bases.

End users become more sophisticated; they are seeking "interoperability" — which I define as the perfect exchange of content — even where that content has to travel across disparate I/O devices, operating and data base management systems, network architecture and CPUs, provided or operated by multiple suppliers. The quest for interoperability has led some content companies to enter the networking business to facilitate the electronic distribution of

their data bases, software and applications processing. Don & Bradstreet Corp., for example, now has Dunnet, and General Electric Information Services Co. has Market.

Also, numerous computer, office and telecommunications equipment companies have co-ventured with other suppliers in the following areas:

■ The physical interconnection of their products; for instance, Northern Telecom,

Inc.'s computer-to-private branch exchange interface.

■ Electronic mail; for example, X.400, the Consultative Committee on International Telephony and Telegraphy's Message Handling System.

■ The compatibility of their operating systems; for example, the recent European supplier agreements involving AT&T's Unix.

■ The interface between systems and applications software; for example, the

Japanese Microsoft Extended Basic (MBX) project to standardize low-end home computer operating systems.

■ The compatibility of storage media and drives (for example, compact disk/read-only memory [CD-ROM]).

■ A broader set of industry-specific interoperability standards, such as GM's proposed Manufacturing Automation Protocol.

More than simple agreements and co-ventures, how-

ever, some players involved in communications hardware have begun to acquire others who have interconnecting components. Among the products that fit together in an interoperable system are terminals, coders, modems, local-area networks, multiplexers, switches, concentrators, private wide-area networks and network management devices. And external developments among suppliers of these and other related products are spreading.

IN SEARCH OF PARTNERS IN INFORMATION

rapidly. As interoperability becomes more universal, so will direct contact exchanges between buyers and sellers. This can be business-to-business, such as with industrial products, or business-to-consumer.

Some information service companies, such as Control Data Corp. with Binfact, General Electric Co. with Dealstat and McDonnell Douglas Automation Co. with Bdi-Net, are attempting to lock up certain business-

to-business segments.

Others, like Visteon and Kierulff, are focusing solely on the broadly based business-to-consumer segment. This is leading to massive contracting of other industries and the potential bypassing of intermediaries between buyers and sellers. I call this process "disintermediation."

Some of the emerging species include travel agents, banks, wholesale distributors, outside sales forces and

certain classes of retailers.

The specter of disintermediation is spurring businesses with deep roots in other industries to enter the information industry. Several laptop and notebook firms have been among the leading computer services since the 1980s. But now they are being joined by other financial institutions, such as Citicorp and Merrill Lynch, and other types of manufacturers, such as GM and Toyota. Moreover, leading players

in other industries are joining the fray, including consulting (Olson, J.C. Penney), distribution (McKesson) and transportation (American Airlines, Norfolk Southern Railway Co.). Sears, like Gold & Winters, which is acquiring Practice-Hall, may simply be diversifying into what they perceive to be a more robust industry. But most of the others are impelled primarily by the need to control the restructuring of their core businesses and only sec-

ondarily by the diversification opportunity.

Interoperability and disintermediation are both causes and effects of global markets. Globalization is a very powerful rationale for externalization. One goal is to gain economies of scale by spreading fixed and semi-fixed costs over a broader geographical base.

But even the largest firms are finding it increasingly difficult to deepen penetration in foreign markets unilaterally. As a result, they have established collaborative relationships with strong indigenous players. Xerox Corp. (Bank Xerox, Fuji Xerox), Honeywell, Inc. (Bull) and Fujitsu (Summa AG, TEW, Amdahl) were among the first to go this route during the 1960s and '70s.

Some of these partnerships no longer exist, and there were relatively few followers until recently. Now such diverse U.S. entities as AT&T Technologies, Dun & Bradstreet, RCA Corp., MCI Communications Corp., General Electric, Amstar and Honeywell are leveraging their products and services, in part through joint ventures and other collaborative agreements with foreign firms.

A second goal related to globalization is to gain access to leading-edge markets and technologies. And this is the principal rationale for the intensifying invasion of North America by European and Asian firms, most often through external development. U.S. print and electronic publishing has become a hotbed of external development activity for British, Dutch and Australian publishers.

Japanese firms, for the most part, have opted for collaborative arrangements in the U.S., rather than outright acquisitions. In many cases, these are OEM arrangements; for example, Ricoh, Canon and Toshiba manufacture image equipment for U.S. partners such as AT&T, Eastman Kodak Co. and 3M Corp. to market domestically. Some are joint development efforts, such as Sharp and RCA in Camco.

Other collaborations leverage Japanese manufacturing and technology experience. Examples include Toshiba and Westinghouse, which are jointly manufacturing CRTs in the U.S., and NEC Corp., which is developing integrated circuits for Corvus Systems, Inc.

Europeans are especially interested in the U.S. A late-1984 survey of European chief executive officers published in *The Wall Street Journal* showed that 45% picked the U.S. as the first choice for foreign investment. Only 28% picked other European countries. Olivetti, AT&T's partner in certain

WE'LL CONFORM TO YOURS.

Motorola Information Systems Group has the hardware you want, the software you need, and the customer-first attitude you thought was a thing of the past.

Our 2000 Series includes UNIX™ derived communicating microcomputers ideally suited to networks.

They incorporate advanced Motorola microprocessor technology which makes the newest, most powerful 2000 Series products upgradeable and software compatible. They can communicate with two mainframes simultaneously, and support more than 350 megabytes of on-line disk storage.

There's a lot of excellent technology around today, but some people sell it as if it were "one-size-fits-all." We think you can do better.

Motorola's commitment to customer satisfaction can deliver an information system that really fits your needs. Call us at 1-800-528-6050, Ext. 1789.



MOTOROLA
Information Systems



MOTOROLA'S COMPUTER, PROBLEM-SOLVING SOFTWARE AND COBOL NETWORKING SYSTEMS ARE TAILORED TO FIT THE WAY YOUR BUSINESS RUNS BEST.

IN DEPTH/PARTNERS IN INFORMATION

European segments, also has cultivated several dozen equity positions in U.S. companies. Spence AG, Plessey Co. and Racal Electronics are among the more acquisitive European hardware firms, while Nixdorf Computer AG, Erlangen, GFR, Alcatel and Nucleon seem to favor joint ventures and other such vehicles.

Ultimately, it is the convergence of information industry interests among the leading players that is driving them to high levels of external development activity. IBM presently asserts its intentions to be a \$100 billion company by 1990, \$185 billion by 1994. Few question its R&D competence, but the goal of achieving and then surpassing a 5% share of the world's swelling information industry market undoubtedly will lead the company to expand external development in the years ahead. Other publicly held firms, smaller than IBM and lacking R&D critical mass, will rely even more on external development in the years ahead. Many are severely limited by current profit and cash-flow pressures in expanding their R&D budgets but can leverage their stock value or debt/equity position in acquiring other firms.

Some smaller, privately held firms are in an even tighter bind. Venture capitalists, until recently their primary funding source, are string out, and the initial public offerings market has tightened up markedly. During the halcyon days of 1983, some 75% of \$3 billion to \$4 billion in venture capital went into the information industry, while some 120 companies in the industry went public for the first time, raising another \$3 billion.

By 1984, these funding sources had dropped by 40%, and they are unlikely to recover fully for some time. Where, yet, if all companies financed by venture capital in 1983 alone had been initially successful, they would have required an additional \$6 billion over the ensuing two to four years to keep going, skirting out subsequent start-ups.

And even where available, R&D monies don't go as far as in the past. Good R&D talent is hard to find, motivate, control and retain. R&D facilities are growing more ancillary, information technologies are becoming more specialized, and the failure rate of new product development is high.

R&D isn't the only area where scale and scope are critical. Many manufacturing, software and service companies find they lack distribution leverage. The leverage they seek may be geographic or horizontal scale, or it may relate to boosting sales productivity or tightening account control. As a result, larger information industry firms with substantial marketing, maintenance and physical distribution capabilities can often readily acquire or collaborate with the manufacturers and developers of their choosing, especially those who bring vertical product market expertise to the table.

The computer service and software sector of the industry was the first to come to grips with these external development drives, and other companies, confronted with them for the first time, would do well to heed the microeconomic lessons learned by this sector.

First, consider the trend in computer services and software. Since 1980, the number of annual U.S. ac-

quisitions has swelled from 30 to nearly 150. Initially limited to raw facilities firms — mainly batch data processing centers, contract programming and time-sharing — the majority of deals now are in content-related areas: software, value-added reselling and remote transaction processing.

Many of the early deals were stock swaps and other easily valued transactions. Nearly 70% of today's acquisitions involve cash, and more than 60% involve contingency valuations, such as earnouts (the amount of money that is paid is contingent on how well the company does after it is acquired).

Automatic Data Processing, Inc. (ADP) was one of the pioneers in growth primarily by external development. By 1973, ADP had already made more than 40 acquisitions, and

by year-end 1984 it had completed more than 100. ADP stands alone among all publicly held firms in the information industry in recording more than 25 unbroken years of growth in revenue and profits. Many other information service firms have been relatively successful in external development. Don & Bradstreet's 1985 acquisition of McCormack & Dodge Corp. stands out in retrospect as a particularly shrewd deal for both parties.

Indeed, there is a growing affinity among content-based information service firms, hardware and telecommunications firms. Younger software suppliers, transaction processors and data base developers find that they cannot afford to develop national, much less international, distribution power by themselves. Microcomputer retailers are highly selective in

stocking software and hardware from smaller, upstart firms. Specialized data base providers and transaction processors lack end-user visibility unless promoted by a strong marketer.

Besides distribution, emerging players lack the wherewithal to develop next-generation products because they are stretched out fully trying to make the current generation successful. Meanwhile, larger companies in hardware, telecommunications, publishing and outside the industry know that they cannot marshal enough talent, vertical market knowledge and, hence, products internally to satisfy their growth objectives and market strategies. They need these smaller content-based firms. And that is why the computer services and software sector has been an early hotbed of convergence.

NOW YOU CAN SEND A MESSAGE ANYWHERE
IN THE WORLD FASTER THAN YOU CAN DO THIS.

IN BRIEF/PARTNERS IN INFORMATION

Outright acquisitions of publicly held firms are expensive. Since 1980, the price/earnings ratios of publicly held information industry players have ranged from double to triple the Value Line 950 all-industry average. On top of that, the acquisition premium (the amount paid over the trading price two months before the acquisition announcement) has averaged 90% more than in other industries. This means that the more successful of the acquired publicly held companies typically are being capitalized at 25 to 40 times earnings. Strategic rationale notwithstanding, this places a tremendous onus on the acquirer of a publicly held firm to pay back its external development investment.

To reduce the risk of not recovering their investment, information industry firms are increasingly pursu-

ing other options. These include acquiring privately held firms with more modest capitalization ratios, often ranging between eight and 15, rather than 25 to 40.

In computer services and services, where deal-making is a way of life, the median transaction has been between \$4 million and \$6 million. And 75% of acquired companies have been lower profile, privately held businesses. In fact, only 2% of acquired information services companies have been stand-alone, publicly held, the balance being divestitures of parts of publicly held firms. Clearly, the bigger deals, like GM/EDS, McDonnell Douglas/Tymshare, IBM/Bahn, Dymal/Metric and D&B/A.C. Nielsen, may grab the headlines, but they are just the "tip of the iceberg" when it comes to information industry external development.

Shopping short of outright acquisition, some firms favor joint ventures with no equity exchanges and no readily determinable valuation. Nevertheless, such arrangements, especially joint ventures, have often proved untenable because the strategic interest of the parties, even when congruent at the outset, typically diverges over time. Witness Honeywell/Dall — a marriage that was eventually annulled, Satellite Business Systems, Inc. — where two of the three original owners have timed out; Pajunen/TKW — a mismatch of intentions and contributions; and Amstar-Bricom, Inc. — unquestionably a naive choice by Bricom for U.S. entry. Governance clashes often paralyze or confuse the management of these ventures. Here, the venture typically lacks a coherent culture unless the partners

are very similar, which is rare.

One less risky vehicle for information industry firms is to invest in venture capital funds directed at areas of potential strategic leverage. Some firms have made the mistake of considering single issues with each one, leading to conflicts and fuzzy objectives, as with joint ventures.

I believe it is better for a firm in this industry to establish its own dedicated fund, typically \$10 million or more, with clear-cut strategic objectives relating to specific areas of technology, market or product development. This strategic capital fund can then be invested in multiple situations, thereby spreading the financial and developmental risks, while maintaining a clear strategic rationale. These investments, which can be managed internally or by an outside agent, can take many forms — minority equity purchases, loans, OEM discounts or R&D resources — with the ultimate objective of jointly leveraging the portfolio companies' capabilities, even mature.

But regardless of the external development vehicle, from outright acquisition to strategic capital funds, successful external development depends on four critical factors:

• **Staying close to and leveraging experience and expertise** — what we call the "strategic core." A survey of the Fortune 100, often quoted by one of the major management consulting firms, shows that only 37% of unrelated acquisitions have been successful, while 64% of those related to an existing internal product, market or technology have been successful.

• **Realism isn't enough;** companies should go for strong, longer term synergies, even over exploitation. They are the color, synergies are the icing.

• **Companies should select affiliates strategically;** they're not duck-shooting. Not all acquisitions or joint ventures can be directed or pre-planned. But when unexpected candidates surface, as they frequently do, successful acquirers will have the benefit of an explicit external development strategy — or at least guidelines against which to evaluate the candidate situation.

• **Once a strategic partner is in sight,** a company should anticipate how the partnership will best function before the transaction is structured. Potential conflicts abound.

Most acquirers wish to retain most or all of their autonomy and culture, yet are seeking some sort of strategic assistance. Acquirers have learned that they need to leverage, not smother or homogenize, firms.

Yet, corporate leadership will want more than an addition to the balance sheet or a new bubble on the corporate portfolio grid. To overcome the potential for conflict, issues of governance, compensation, reporting, mutual assistance and cultural independence should be agreed upon before the deal is struck.

About the author

Barry Pappal is a partner in Bradenton Associates of Port Lee, N.J., a merger and acquisitions consultant to companies that are in the information services/technology industry or such participation in it. Pappal came to Bradenton from Bain, Allen & Hamilton, Inc., a management consulting and technology firm, where he was a senior vice president and a managing officer of the information technology practice.

IMAGINE.

YOUR IMPORTANT INFORMATION THAT HAS TO ARRIVE CLEAR AMONG THE WORLD IN A MATTER OF SECONDS CAN ARRIVE THERE EVEN SOONER... IN THE BLINK OF AN EYE.

WHAT MAY SEEM TO YOU LIKE AN IMPOSSIBILITY IS JUST AN EVERYDAY OCCURRENCE. THAT IS, IF YOUR BUSINESS USES TELEMAIL® ELECTRONIC MAIL SERVICE FROM GTE TELENET. UNLIKE MANY ELECTRONIC MAIL SERVICES, WHEN YOU USE TELEMAIL YOUR MESSAGE CAN BE DELIVERED TO OR FROM VIRTUALLY ANY TERMINAL, PERSONAL COMPUTER, OR TELEX DEVICE, WORLDWIDE. IN FACT, YOU CAN SEND YOUR INFORMATION TO A THOUSAND PEOPLE FOR THE SAME COST AS SENDING IT TO ONE.

YOU CAN BE SURE YOUR INFORMATION WILL GET WHERE IT IS NEEDED, AND BE BOTH COMPLETE AND ACCURATE. THAT'S BECAUSE TELEMAIL USES THE TELENET PUBLIC DATA NETWORK, THE LARGEST, MOST AVAILABLE AND RELIABLE DATA NETWORK IN THE WORLD, WHICH MEANS YOUR INFORMATION CAN NOW BE DELIVERED IN A FRACTION OF THE TIME FOR A FRACTION OF THE COST.

TO BE HONEST, WE THINK THAT'S PRETTY AMAZING. FIND OUT FOR YOURSELF HOW AMAZING. SIMPLY CALL 800-TELENET, OR TELEX: 284319 GTE TCC AND ASK ABOUT TELEMAIL.

FROM GTE TELENET—WORLD LEADER IN PUBLIC NETWORK SERVICES, INTERNATIONAL NETWORK SERVICES, PRIVATE DATA NETWORKS AND INTRANET NETWORK APPLICATIONS.

GTE TeleNet

NOMAD2 Is SERIOUS About DSS

NOMAD2 is the only 4GL where you can do **SERIOUS** modeling, consolidations, goal seeking, and what-if analysis—even on time series data, using simultaneous equations if you wish. All in one integrated product.

- You do not need to interface through external products.
- You do not need to transform your data into new formats.
- You do not need to build your own financial functions.
- You do not need to duplicate your investment in training.

The bottom line is that planners and analysts throughout your organization can use the same product that serves your IC users and application developers. And that means your software expenditures, your training and your support costs are consolidated in a single software package.

NOMAD2's decision support capabilities are in keeping with the tradition of innovation established by D&B Computing Services. In making NOMAD2 available for use on in-house mainframes, we have continued the evolutionary process we began when NOMAD was first introduced in 1975. And it is this evolution that has catapulted NOMAD2 to the leadership position it holds in the marketplace.

Most people who try NOMAD2, buy it. You owe it to yourself to find out why.

NOMAD2:
An Innovation In
End-User Computing
From Dun & Bradstreet

**D&B Computing
Services**

a company of
The Dun & Bradstreet Corporation

For more information call Roger Cox at (203) 762-2511. Or drop your business card into an envelope and mail it to Roger at: D&B Computing Services, 187 Danbury Road, Wilton, CT 06897

NOMAD is a registered trademark of D&B Computing Services, Inc.

IN DEPTH

Understanding the DP professional

A primer for the wives, Part 2
husbands, friends and lovers
of people who
speak computerese

Last week, Part 1 of this two-part series interpreted the language of computer professionals for laymen. Part 2 describes the various jobs that make up data processing. Why not hear this article out and show it with someone who doesn't speak computerese.

By Bruce Kula

Phyllis is one of four systems analysts who work for the First National Bank of Erewhyna. This morning, Phyllis is meeting with Harriet, the supervisor in filing.

Harriet has a problem. Every day she receives a list of the files required by bank employees (employee files for the personnel department, financial information on clients for the loan department and so on), which Harriet's clerks try to locate.

If a desired file isn't on their shelves, Harriet finds out its location, then fills out a card with that information and the date the file should be returned (it's a bank policy that no one may keep a file for more than a week). Every day, Harriet shuffles through her cards to ascertain who must be notified that day that they have held a file too long that someone else requires. Harriet explains all this to Phyllis, who happens to have no prior knowledge of the way things work down in the filing department.

As Phyllis listens, she detects a bit of jealousy on Harriet's part — most other departments have computer terminals to help them do their work, but filing is still doing everything by hand. Harriet's knowledge of computers is as vague as Phyllis' knowledge of filing, but she realizes a computer would help her keep track of her files better, which would allow her more time to address more important tasks.

Phyllis hears jealousy, perhaps, because she has a good ear for what people really mean, even when the people have some trouble expressing themselves. Phyllis thinks of herself as a people-oriented person, as opposed to some of her colleagues, whom she considers (rightfully so) more computer-oriented.

So as Phyllis heads back to her desk, her head filled with new information about the filing department, she is thinking about two problems: first, increasing the efficiency of filing by



VANECKO

ILLUSTRATION BY JIM VANECKO

99

The most biting insult one can give a systems analyst is probably, "We were doing it faster before you put it on the computer."

automating their procedures (giving them access to a computer system for tracking files); and second, giving filing a system that will make the department more satisfied. It isn't hard to automate procedures in such a way that things are worse than they were before. In fact, the most biting insult one can give a systems analyst is probably, "We were doing it faster before you put it on the computer."

Phyllis sits down at her desk and thinks. She might just sit and think for the rest of her working day, without so much as committing a word to paper. But this filing problem doesn't happen to be very difficult, and she starts sketching a flowchart after a few minutes. Her first flowchart has boxes and arrows, representing what kind of information filing has to keep track of, where

they get it and what they do with it. Then she scribbles a second flowchart. This one has special symbols for devices in the computer system, such as a terminal, disk storage and so on. Finally, she works on a very complicated flowchart that represents the way programs in her imagined filing system will work.

Not all systems analysts use flowcharts, but Phyllis was trained that way, and she finds they help her think about how a system should be put together. She also finds it is a

good way to express to a programmer how the system will be written. By the end of the day, Phyllis has the specifications for a system that she thinks will work well for Harriet. She starts a memorandum to her boss, describing in a general way how her system will work and how much time it will take to design, write and test it. Her boss will look over her proposal and make a decision: Will the cost of assembling an automated system for filing be justified by its advantages? Phyllis' an-

swering of people will serve her in good stead, since it helps her to write a very convincing proposal. Phyllis has a certain general understanding of how a computer system works, but she couldn't explain it in a technical way. She's smart, intelligent, really, in the way people work.

Phyllis makes \$37,000 per year.

Applications programmer
Jack is one of a dozen applications programmers at First National of Eureka. He works very closely with Phyllis some days. She describes for him what he has to do, and he does it. But Phyllis is not Jack's boss, even though she makes a little more money and has a few more years' experience. She might be thought of as an architect and Jack as a builder — equal partners, in a way.

This morning Phyllis has handed over a sheet of documentation to Jack, all of which has to do with a new automated system for the tracking of film. Phyllis has gotten approval for the project and has put together a formal design and all the other information Jack will need to write the programs for the system. After an hour or so, Jack feels he understands the project well enough to get to work on it.

He leaves the conference room, sits down at his desk, types in his password on his terminal — and his phone rings. It's the computer operator.

The computer operator informs Jack that the monthly statement system has "blown up" on an 80C1 in MSPFT021, which means to Jack that one of the programs he is responsible for requires his attention. It just so happens he didn't write the program that failed, but Jack's boss has assigned responsibility of the monthly statement system to Jack, so when there is a problem with it, it's Jack's problem.

Naturally, the new filing system documentation gets set aside while Jack deals with this new problem. He remembers his task: a listing of program MSPFT021 in the language the original programmer used when he wrote it (the source code), a listing of computer storage as it looked when the program failed (the dump) and his computer terminal.

From the source code listing, Jack ascertains that no one has changed the program lately — the most recent change occurred two years ago. He looks at the dump and calculates where the program began in computer storage and where it failed. Skimming the second hexadecimal address from the first, he figures out exactly what instruction was being executed when the program died. Going back to the source code (which he understands better than the machine code of the dump) he discovers the program was working on calculating the day of the week — Sunday through Saturday — from the Gregorian date (which happened to be February 28).

Tricked by leap year

Now Jack is suspicious because, as all programmers know, routines that process a date must take into account the possibility of leap year. A little more checking through the program confirms his suspicion: Program MSPFT021 was written without regard for the fact that February sometimes has 29, not 28, days. The

IN JULY THE INFORMATION WORLD WILL BE IN CHICAGO.

Where Will You Be?

In today's highly-competitive world, everyone needs an edge. And in today's highly-electronic world, that edge is often the most up-to-date information technology.

That's why both computer specialists and business professionals will be at the 1985 National Computer Conference. Where tomorrow's technology is happening today. You'll find:

- The latest developments in hardware, software and services, focusing on applications.
- Over 700 major exhibitors showcasing the latest developments in the industry.
- 84 Technical Sessions on subjects such as Artificial Intelligence, Personal Computing and Networking.
- 27 Professional Development Seminars dealing with specific areas like Data Communications, Human Resource Management and Voice Processing.
- A Keynote Address, "Managing the Creation and Commercialization of Technology," given by Admiral B.J.R. (Bobby) Brown, President and CEO of Microelectronics & Computer Technology Corporation of Austin, Texas.

• Pioneer Day honoring the contributions of Argonne National Laboratory, Oak Ridge National Laboratory and the University of Illinois.

• And more!

Call 800-NCC-1985

To register or find out more details call 800-NCC-1985, or mail in this coupon today. NCC '85—We put you on top with today's Information Technology.

☐ 1985 National Computer Conference
Technology's Expanding Horizons

☐ Yes! I want to attend NCC '85! Please send up a registration form today!

Name _____

Title _____

Company _____

Address _____

City _____

State _____

Zip _____

☐ If you would like information about exhibiting at NCC '85, please check here.

Mail to: NCC '85 • 1899 Preston White Dr. • Reston, VA 22091

OR CALL TOLL-FREE 800-NCC-1985 AND REGISTER TODAY! Visa, MasterCard and American Express accepted. Register early and save \$25!

IN DEPTH/UNDERSTANDING DP PROFESSIONALS

routine for figuring the day of the week was confused by the fact that the day after February 28 was not March 1, and faced with what it considered an impossibility, abandoned — came to an abnormal end.

Turning to his terminal, Jack types in the commands that allow him to fix the source code so that a leap year is recognized as a possibility by MSFPT021. Then he runs the job to translate the program into machine code. Lastly, he tries out the program to make sure he has really fixed it. It turns out he has: The program goes to normal EOJ — End Of Job.

Now there are forms to be filled out: first, a problem report, explaining what went wrong and why and what Jack did to fix the problem. That will go to the computer room supervisor. Next, a form describing

the changes Jack has made to program MSFPT021, a file or two averting that Jack has thoroughly tested his fix and a request that his new version be given production status. That will go to the data processing department librarian, who will move the program to the proper computer library for tested programs.

And the filing system Phyllis turned over to Jack? That must wait until tomorrow.

Jack makes \$33,000 per year.

Computer operator

Usually, there are two computer operators on the day shift at First National, but Jim has called in sick, so Elaine will be handling the computer room by herself today. That's the first thing she learns when she comes to work. The second thing she learns is that she is going to have

some extra jobs to run today. It seems a mechanical failure of a printer caused some jobs usually run on the night shift to be deferred. The printer has been repaired.

Elaine finds all this out by looking at the turnover sheet, a document used at First National to allow communication between operators from one shift to the next. Of course they can also talk to each other, but the turnover sheet provides permanent documentation and helps ensure that an operator just starting work has all the information required to do his job.

Next, Elaine checks her job schedule. This schedule lists jobs that must be run during her shift, in order by time and priority, along with any special procedures involved. She notices, for example, that someone has requested that last month's In-

terview Experiences Reports should be printed again; that means she must use last month's information (stored on tape) instead of the current month's.

The First National's computer room has two display terminals: one is the computer console, which Elaine uses to communicate with the computer about which jobs are running, which jobs should be initiated, which tapes should be mounted on tape drives, which forms should be mounted on printers and so on; the other allows Elaine to monitor the status of the operating system and the system that controls user terminals.

At this second terminal, Elaine can, for example, ascertain how many people are using their terminals at any given moment and whether their response time (the amount of time it takes for the computer to respond to their requests — is at an acceptable level.

At First National, users expect to see a screenful of data within three seconds after they type in a request. Elaine checks her system and discovers average response time is currently 0.2 seconds, which is very good, but to be expected at 8:00 a.m. when few users are on the system. At 10:00 a.m., she knows, average response time will be more like 2.9 seconds, because about 40 people will be using terminals at the same time.


Getting things moving

Elaine submits her first jobs of the day to the system. For some of these she uses a card reader, some she initiates by typing commands on her console. The programs start running, under the control of the operating system, which will send messages to the console screen if the programs require any human intervention, such as the mounting of tapes or forms, from the operator.

Elaine happens to know the jobs she has submitted will chug away in the computer for an hour or so before anything more is required of her, so she sets to work on some of the maintenance tasks for which she is responsible. The tape drives have to be cleaned occasionally to work properly, and the printers, which collect paper dust from the forms fed through them, must be thoroughly vacuumed. New tapes must be labeled, and new computer room documentation must be filed.

At 9:30, Elaine makes a quick check of the system, alerts the computer room supervisor and takes a welcomed coffee break. She is not allowed to smoke, drink or eat in the computer room. Smoke molecules from a cigarette could keep a disk drive from reading data properly, and a spilled cup of coffee could disable a computer worth millions of dollars.

When she returns to the computer room, Elaine notices a message on the console: A program in the monthly statement system has failed, and the operating system has diagnosed and reported the problem. Elaine goes to a list-tacked to the bulletin board and discovers that Jack is the programmer responsible for the monthly statement system. She telephones him; he requests a dump. Back at the console, she finds that the operating system has saved about 300 pages of output from the failing job. She types in a command to start printing the output, which



**"ZIP+4 codes
will save
Montgomery
Ward over
\$400,000 a year."**

MAIL THIS COUPON TO SEE HOW YOUR COMPANY CAN SAVE, TOO.

ADDRESSING TOMORROW TODAY.

© 1985 ZEN

In June, we'll help you turn out profits on an assembly line.

Manufacturing industries are getting more competitive every day, with enormous pressures to improve productivity methods. Which is why so many manufacturing companies are beginning to see the true potential of increased computerization.

And the result is new partnerships between MIS/DP, production, and design management. So in the June 19th issue of *Computerworld Focus*, we'll tackle industrial automation, one of the fastest growing segments of the computer industry today.

We'll put CAD/CAM, robotics, local area networks and MRP in perspective. Then discuss ways to link dedicated manufacturing computers with the corporate information system to integrate the entire process, from engineering design to assembly to quality control to inventory control to shipping to billing all the way to accounts receivable.

And we'll reach more than 126,000 paid *Computerworld* subscribers with that information. Not to mention our high pass-along readership. As well as bonus distribution at Advanced Manufacturing Systems '85 in Chicago.

But that's not all you'll get for your advertising dollar. Because Starch INRA Hooper will be performing a detailed advertising readership study on our June issue.* So you can see how effective your ads are. And how effective your competitors' ads are.

So if you want to mass produce profits, your chance is here. Get your ads in *Focus*. *Computerworld Focus* on Manufacturing. The June 19th issue, closing May 10 (materials due one week later).

For more information, contact Ed Marecki, National Sales Director, *Computerworld Focus*, 375 Cochituate Rd., Framingham, MA 01701. Or call (617) 879-0700.

*A minimum size of 7" x 10" (500 lines) is required for ads to be eligible for a Starch study.

COMPUTERWORLD FOCUS

We put the hottest issues of the day in *Focus*.



BOSTON: (617) 879-0700 NEW YORK: (212) 967-1350 ATLANTA: (404) 394-0758 CHICAGO: (312) 627-4433
SAN FRANCISCO: (415) 421-7330 LONG BEACH, CA: (714) 261-1230 HOUSTON: (713) 952-1220

IN DEPTH/UNDERSTANDING DP PROFESSIONALS

she eventually will tear off the printer and give to a data control clerk, who will put the listing in a bag marked "Programming Staff," from where it will be collected by a secretary, who will drop it on Jack's desk.

Then, of course, there is a form to fill out. Elaine must write up a problem report to document what happened.

There are some operators, like Elaine's assistant, Jim, who enjoy being computer operators and wouldn't change jobs for the world. Elaine, however, has different plans. She is taking night classes to earn a degree in computer science, in the hope that she will be selected for the next opening for a programmer trainee on First National's programming staff.

She won't make much more money as a senior programmer, but Elaine

has an interest in, and an aptitude for, the technical side of computers. Her goal is to become a systems programmer.

Elaine makes \$28,000 per year.

Systems programmer

Richard is the most experienced of the four systems programmers at First National of Eriewyana, with six years worth of systems programming experience behind him. Before he became a systems programmer, he was an applications programmer.

As applications programmers gain seniority and skill, they often have to come to a decision about which way to go in their careers. Phyllis, who was an applications programmer at the same time as Richard, decided that she had little interest in the computer itself and worked to become a systems analyst.

Richard, on the other hand, discovered every tidbit of information he could find about computers and operating systems, built his own home computer, subscribed to two computer publications and became a systems programmer. Unlike Phyllis, Richard could describe in great detail how the system worked. When Phyllis speaks of the operating system, she says "the system"; when Richard speaks of it, he says "my system."

Toughest time

Of all the technical people at First National, Richard believes he has the toughest time explaining to an outsider what he does for a living. The last program he wrote was a fairly complicated assembly language program that collected statistics about how the system was working, which

allowed Richard, the other systems programmers and the operator, to view the status of the system on a terminal and to keep an eye on such indicators of the system's health as average response time. He explained the program to a friend, who understood it fairly well after 40 minutes, at which point she fell asleep.

Even though Richard's programs are a little difficult to describe, what is worse than that is the fact that even though his title is systems programmer, he really very seldom writes a program. This month, for example, Richard is installing a new version of a tape management system, which will not require writing any programs. This system keeps track of what information is on the thousands of tapes First National has.

Richard has finished reading the documentation that came with the new system, which included three thick manuals, a 30-page document describing installation procedures and a 40-page document describing problems with the new system. Today, Richard will go through the list of problems again very carefully and fix any problems that might affect the tape management system when it runs at First National.

Any new software that Richard installs is likely to have something wrong with it, no matter how much the bank paid for it or how reputable the software vendor is. This is because computer installations vary widely from each other in their amount of hardware and software. Depending on the environment, a perfectly good program may go awry. Therefore, software vendors often will ship software with a list of warnings, alerting the system programmer that such and such an environment requires this or that change in the installation procedure or in the software itself.

Sometimes the new software is put on tape and made ready for shipment before a problem crops up, and the vendor will provide only a description of the problem, some way to fix it once the software is installed and the promise that future versions of the software will be sold with the problem fixed.

The first problem Richard reads about says "Multiple volume output files cause excessive label processing time at 1,800 BPI." Richard knows nearly as much about the hardware environment at First National as the software environment and realizes this problem will not affect his system. He makes a note to himself at the top of this page: "Fix not applied."

The next problem reads "24/51-bit dual-mode processing may cause register corruption resulting inabend when multiple volume output for input." This gibberish makes perfect sense to Richard, who writes "Fix applied 29 Feb." at the top of the page and starts typing at his terminal. The software vendor has provided a way to get around the problem of register corruption by changing the code of one of the programs in the tape management system.

In this case, Richard cannot make a change to the program in the same way Jack makes a change. Jack changes source code, the language of programmers; Richard changes object code, the language of computers. Richard will make his changes using a program that accepts hexadecimal

They're keeping RCA Cylix a secret because they don't want their competition to hear about our value-added data communications network. They know that control of fast, accurate data communications is vital to keeping ahead of the pack. And they're delegating the details to us because we assure them better control.

We achieve this control by keeping ahead of the latest technology changes, and maintaining a close relationship with all major carriers. At our central switching facility, back-up equipment assures maximum uptime. And, our Customer Resource Teams stand ready around the clock to address customer

needs quickly, before valuable time and data are lost.

The RCA Cylix on-line network offers satellite-based, end-to-end management of your synchronous data communications. Plus, a continuing array of new services, including dial-in asynchronous, to make sure your network is no less than top notch. The result is single-vendor simplicity with no capital investment, available throughout the U.S. and Canada.

To find out more about why RCA Cylix is the best kept secret in data communications, send the coupon or call 901-761-1177 fast. Before your competition hears about us.

☐ Please send me your RCA Cylix "The Best Kept Secret in Data Communications."

Name _____
 Title _____
 Company _____
 Address _____
 City _____ State _____
 Zip _____ Phone _____
 Please send me (including installed)
☐ 24/51 BPI output ☐ 24/51 BPI input
☐ 24/51 BPI 24/51 BPI
 How many of your lines are on 24/51 BPI?
 Type of terminals: ☐ 24/51 ☐ 24/51
 RCA Cylix
 Dept. MC
 10000 Highway 10, Suite 100
 Memphis, TN 38115

Cut

**Why key DP/MIS managers
are keeping RCA Cylix a secret.**



IN DEPTH/UNDERSTANDING DP PROFESSIONALS

numbers, not English-like statements, as input. The reason for this is that the purchased tape management system is sold only in the form of object code. The vendor refuses to sell source code, which could be plagiarized more easily by other software companies than the object code could.

Richard, unlike Jack, will not test the change he makes. Usually, he takes the software company at its word that a particular fix will solve a particular problem. Anyway, the system Richard works with are normally so complex that Richard could not possibly find time to test all their functions. Even the software vendor probably has not done that. Richard will install a system, try out a few of the major facilities the system provides and, if they work, he'll consider his job done.

Unfortunately, when one of Richard's systems doesn't work, nearly everyone at First National finds out about it — because failing systems software makes it impossible to use the computer. For that reason, he gets more phone calls in the middle of the night than any other programmer at First National.

Richard is paid \$37,000 per year.

Software engineer

Susan is employed by Tape Management Systems, Inc. (usually known as TMSI). Her company sold a type of computer programs called Supertape to the First National of Erewhyna, as well as 100 other businesses. Supertape can be used to maintain a sort of index of a computer installation's tapes. Instead of a computer operator figuring out which tape to use for a particular job, Supertape will figure it out and write a message to the console screen that says "Mount tape number 4501," or words to that effect. This makes the computer operator's job easier and reduces the number of mistakes that can cause data to be lost. So First National was happy to lease the Supertape system for \$2,000 per year.

Susan wrote most of the programs in the Supertape system. When a problem is discovered in the field ("in the field," at TMSI, means "at a customer site"), it is her job to fix it. There are other software engineers responsible for other software that TMSI sells and leases.

TMSI has a system on one of its own computers — the Problem Report System — for keeping track of any trouble that customers have with their software. Susan can go to her terminal every morning and get a pretty good idea of how she will spend her day.

This morning she discov-

ers a problem report submitted by a bank in Erewhyna. The bank uses some tape drives that can only handle one kind of tape: a tape whose data has been recorded at a density of 1,600 bytes of data per inch of tape. When the computer operator inadvertently mounts a tape recorded at a higher density on one of these drives, Supertape should send a message to the operator's console that says, in effect, "Wrong tape drive for this

tape." According to the problem report, what actually happens when this situation occurs at the Erewhyna installation is that the whole operating system stops dead. After this minor operator error, in other words, the bank's daily processing is interrupted.

Susan's first step in solving this problem is trying it out herself, to see if the problem occurs as it was reported.

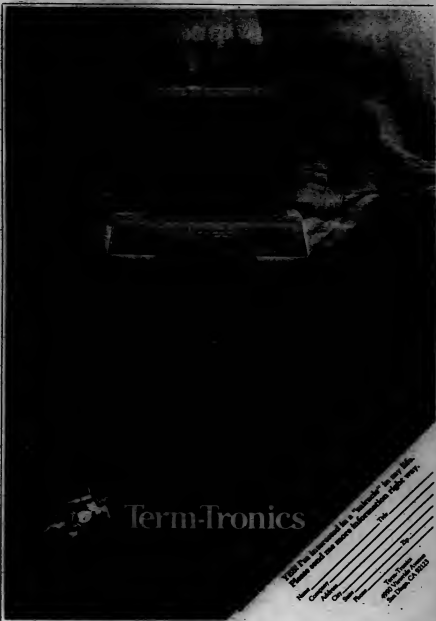
She goes into a laboratory

down the hall where a computer and peripheral equipment are available for her (and the other software engineers) use. She starts up a program that will request a tape mount. When the console shows the request, Susan mounts a 6,250 byte/in. tape on a 1,600 byte/in. tape drive. This should cause the system crash described by the customer.

But it doesn't happen that way. On the system console is a message that says,

"Wrong tape drive for this tape." As far as Susan is concerned, Supertape seems to be working exactly as it is supposed to work.

At this point, Susan could close the problem as "not reproducible" — a nice way of saying the customer is wrong. But she has gotten problem reports from this bank in Erewhyna before, and it seemed like a professional outfit that would research a problem pretty thoroughly before calling



Term-Tronics

YES! This information is a "must-have" in my file.
Please send me more information right away.

Name _____
Company _____
Address _____
City _____
State _____
Zip _____
Tel. _____
Fax _____
Telex _____
4950 Santa Anita
San Diego, CA 92123

IN DEPTH/UNDERSTANDING DP PROFESSIONALS

77

Almost immediately, Susan is on to something. It seems the bank does not use the same brand of tape drive as TMSI.

TMSI about it. She assumes the problem is real and that she simply has not been able to imitate the steps leading up to it.

She calls TMSI's customer service department and asks the representative who handles the First National account some questions, trying to ascertain what is different about her test in the laboratory from what is happening at the bank. Almost immediately, she's on to something. It seems the bank does not

use the same brand of tape drive as TMSI. A different kind of tape drive could be an eventuality for which Superstage is not prepared.

Hardware (like a tape drive) communicates with software (like Superstage), and the software has to be able to ascertain just what kind of device it is conversing with. Susan surmises that Superstage has not properly identified the tape drive it is communicating with at First National.

She pulls out a program listing and scans through it until she finds the code that checks for tape density mismatches. After a few minutes, she sees the problem: Superstage checks the brand of tape drive being used after it checks the density; it should do that before. The language spoken by this different brand of tape drive makes Superstage go on as if everything is all right, leading, a few nanoseconds later, to disaster.

Trial run

At her terminal, Susan makes the changes to the erroneous program. She tests artificially, without a tape drive at all, by sending the program data that looks like the sort of thing a tape drive would send. Now the program reacts properly.

She fills out a form with the name of the program, the problem she has found and a brief description of what she did. This goes to the test group at TMSI, which will recheck her work. Eventually, it will become part of a new version of Superstage, which will be sent to all customers who lease it.

Susan makes \$34,000 per year.

■

Just the surface of talking to and understanding computer professionals has been scratched in these two articles. Many data processing jobs, systems, devices and concepts have been ignored — on purpose.

My intent was to describe things in a general enough way that most of the concepts and terms will apply to any computer installation. Ideally, your friends in DP will expand upon these articles by relating what I've written to their own experiences.

About the author

Bruce Kula is currently a software engineer for Paradyne Corp. in Leavenworth, Fla. He has been a truck driver and a high-speed planer operator in Wyoming and a systems programmer near Detroit. He now lives in Florida on the shore of the Gulf of Mexico.

The new Burroughs A15 very large mainframe.

Whether or not you presently own a Burroughs system, your business can benefit appreciably from the A15.

At more than 2½ times the power of Burroughs' previously largest system, the A15 is very impressive.

What's equally impressive is its cost-efficiency.

With the A15's addition to Burroughs' A Series, our users will be able to increase programming power up to 70 times without the expense of reprogramming. And like every A Series mainframe, the A15 is designed to cost less to run and require fewer support people.

Moreover, the A15's flexible networking capabilities allow it to communicate with competitive systems, so you won't have to feel

locked into your current computer company. Or locked out of Burroughs' bottom-line benefits.

To further maximize productivity and cost-efficiency the A15 uses Burroughs' InterPro® software. Bringing the programming and operational ease of personal computing to this very large scale system.

And since the A15 combines new high speed, high-density circuitry with Burroughs' innovative architecture, it attains advanced levels of performance and efficiency.

What's more, we'll start shipping the low end A15 systems in September, 1985—and the high end systems in Spring, 1986—almost a year ahead of the biggest computer company's comparable system.

If you're feeling trapped by rising computer costs, talk to Burroughs. We think our company and the new A15 could be your way out.

 **Burroughs**

IBM/38-36 BACKLOG REDUCTION

The world's most successful computer house meets Fujitsu Products Ltd., the leading supplier of query/report processor and spreadsheet software for the IBM/38-36. Call 415 444-4760 or write.

Fujitsu Products International

980 Lakeside U.C. Bldg. 705

San Jose, CA 95128, San Francisco

Fujitsu

IN DEPTH

Microprocessors

What you need to know

By Stephanie Di Donato

From a user's perspective, the microprocessor is the most distant element of the computer, and a part he might not often consider in a purchasing decision.

The primary rule of microprocessor selection is: Unless you are writing a program in the instruction language of the microprocessor itself, you are interested in the choice of microprocessor made by a computer vendor only insofar as it affects the layers of the system closest to you.

Understanding the selection of microprocessors requires understanding the process as a whole. First, applications programs should be located to serve the particular requirements of the current and projected uses of the computer.

The SAS System...



The Solution for Your Information Center

Now Available
for IBM PC/370



- ☐ I want to learn more. Send me The SAS Solution packet.
☐ Have a sales representative call me today!

Please complete this coupon or attach your business card.

Name

Title

Company

Address

City State ZIP

Phone ()

Hardware

Operating System

SAS Institute Inc.
 SAS Circle, Box 8089, Cary, NC 27513-8089

SAS

IN-DEPTH/MICROPROCESSORS

77

While corporate purchasers should not rush off with the crowd, they should be cautious when they are on a lonely trail.

Second, any programming languages that are required to support those applications should be located. If the application is already translated into computer instructions, this step is not required.

Third, the operating system that is required to run the applications and programming languages must be identified. And finally, the microprocessor type and computer system needed to run that operating system can be considered.

This chemical approach is often difficult for a corporate buyer to apply, because the purchase may be contemplated to support a more general decision support or computer literacy goal. Perhaps the organization is preparing for a corporate standard of purchase that must support all applications. In this case, since the applications mix will be

unpredictable, it is usually best to consider systems suitable for the widest possible mix of applications.

Here it is possible to apply some indirect microprocessor selection rules. To do so, the buyer should know what microprocessor is used in the products being considered and what is used in the major product offerings in the marketplace as well.

The first question to ask about the microprocessor is how often it is used — not a very technical issue, to be sure, but a very important one. A

microprocessor chip used in various products will have many skillful programmers supporting it. More programs will be written for it. Its popularity is an indication of market suitability and of some history of satisfactory performance.

Finally, other people with the same selection to make have obviously chosen it. While corporate purchasers should not rush off with the crowd, they should be cautious when they are on a lonely trail.

The second question about a mi-

croprocessor is upward compatibility. This is a little more technical and relates to whether the microprocessor is a member of a family of products that provides for performance growth but retains the same basic instruction set and operating concepts. Buying the last or largest of anything leaves nowhere to go but down.

The final question to ask, and the question to be asked only if the process to this point results in more than one candidate, concerns the technology of the product. The evaluation of microprocessor technology is something best left to computer scientists; if at all possible, a team should participate in any decision that gets this far.

The team should include managers and business professionals. Specialists tend to select technologies that are interesting, topical and modern, not necessarily practical. Managers and business professionals should probably control the selection process.

Instruction sets

One area in which users often are misled is the power of instruction sets. Some microprocessor products have flexible and sophisticated instructions, and using those instructions may improve the performance of a given business application significantly. Users may even select a microprocessor based on the ability to support floating-point calculations directly through custom instructions.

Unless you intend to program directly in machine (or assembly) language, be sure that the language you select will use any special instructions before you buy a microprocessor that supports them. You might think that any language written for a computer would support all the instructions available on its microprocessor, but they do not.

The primary grouping of microprocessors is by the width of the data bus — the only meaningful measure of bit size.

Thus, the Intel Corp. 8086, the

Terminals and monitors known
to the companies they keep

From which history
that you can still terminate

TATUNG

U.C.M. COMPUTER PRODUCTS
CANADA LIMITED
7225 Woodbine Ave., Unit 116
Markham, Ontario L3R 1A5
(Canada only) 1-800-367-6678
1-416-475-1208 Telex: 08-685222

WESTERN MICRO SYSTEMS
A Quality Distributor
Serving the 13 Western States
Western States 1-800-544-0039
In California 1-800-336-9800

SEE US AT COMDEX - BOOTH 5352-5354

For complete information call toll free: 1-800-421-2828. In California, call (213) 676-7085.
TATUNG COMPANY OF AMERICA, INC., 2889 El Presidio, Long Beach, California 90806.

ROBOT
38



The IBM System/36. We made it bigger by making it smaller.

This IBM System/36 is about the size of a two-drawer file cabinet. Yet it gives you access to the wide range of applications and capabilities of the System/36 family.

For instance, the model 5362 System/36 integrates data processing, text processing and color business graphics. And with more than 1,000 applications to choose from, it can handle just about anyone's needs in almost any business—as a stand-alone computer in a small company, or as part of a large company network in a department or at a remote location.

Like all System/36 models, the 5362 can communicate with a range of IBM computers—from the IBM PC up to IBM's new 309X mainframe processors. With PC Support/36 software, you can expand the capabilities of your existing PCs by exchanging information and sharing resources with any member of the System/36 family.

Add IBM office system software like DisplayWrite/36 and Personal Services/36 to the 5362 processor and you've

got a hardworking office system complete with word processing, calendaring, scheduling, and message and mail handling.

The 5362 is easy to install; just plug it into any I/O outlet. It's also easy to use. More than 2,000 "Help" screens lead you through any rough spots.

It can provide information sharing for up to 80 users. And you can add memory and additional features simply by inserting plug-in modules. The 5362 is easy to grow with. And because it's part of the System/36 family, it's easy to grow from.

So you see, no matter how small your office, you've got plenty of room for a powerful System/36 processor. Just look under your desk.

To see this system, call your IBM representative, IBM Product Center, or IBM System/36 Value Added Reseller. Or for literature call 1 800 IBM-2468 and ask for ext. 90.

IBM

IN DEPTH/MICROPROCESSORS

77

Because the newer Intel chips, such as the 80186 and the 80286, use the same interrupt for a different purpose, there could be software compatibility problems.

flexible memory management scheme.

The biggest handicap Intel has with its series is also its biggest boast: the IBM Personal Computer family. It seems that when Microsoft Corp. developed the PC-DOS operating system for IBM, it used an interrupt on the 8086 that was reserved for use by the hardware in future developments. The use of the interrupt is written into most of the thousands of programs produced later for the Personal Computer. Now, because the newer Intel chips, such as the 80186 and the 80286, use the same interrupt for a different purpose, there could be software compatibility problems.

68000. A Motorola product, the 68000 actually enjoyed a brief lead over the Intel family until IBM made its decision. Unlike the 8086 computer series, which uses segmented memory only, the 68000 has the ability to address up to 16 MB of memory directly.

The 68000 family is a virtual memory, page-oriented microprocessor. It also has an instruction set that is very similar to that of the popular DEC PDP-11. This combination has made the 68000 the prime target for AT&T's Unix operating system among microprocessors. Unix offers several computer users an excellent migration path, because it is supported on computers up to the mainframe class. Its primary drawback is the relative lack of good commercial software for Unix.

Most Unix programs are written in the C programming language, an uncommon vehicle for commercial software but a solid language nevertheless. The 68000 comes in several models, the current champion being the 68010. There is even a 68000 with an 8-bit data bus, the 68008, which offers a kind of Motorola 8088 flexibility but has not really caught on. This processor has expanded page-handling capabilities and an improved scheme for pre-fetching instructions so the arithmetic logic unit always has something to work on. Apple Computer's Macintosh family uses 68000 microprocessor chips, but at present both the user and the developer are somewhat insulated from the chip by the language and operating system structure of the machines. If you think you need a 68000 chip for some technical reason, it is highly unlikely that Macintosh will let you get close enough to it.

80286. National Semiconductor's family of microprocessors offers many excellent features but has had little commercial use in microcomputers. The family has members with 8-, 16- and 32-bit data paths, generally upward-compatible throughout the range. The 16-bit chip, the 32028, has the same 1-Mbyte address space as the 68000, and an accompanying memory management unit offers virtual memory support. The instruction set is considered by many to be the best on a microprocessor, and several computer manufacturers of fault-tolerant

systems have based their designs on the National Semiconductor product.

There is a Unix operating system implementation on the 32028, and most of the popular language processors are implemented for it. Given a chance, the 32028 series could be the basis for a very powerful computer system.

Most users should never become involved in technical evaluations of microprocessor chips because there are too many other factors, such as

What every IBM PC user should ask before buying the "Sider" 10 MB hard disk:

When a company offers a superior quality 10 megabyte Winchester hard disk for only \$795, it's bound to raise a few eyebrows...and a lot of questions. The fact is, you're probably already wondering "Can it really get 10 megabyte hard disk reliability for only \$795?" The answer is **ABSOLUTELY**...when you choose the Sider from First Class Peripherals.

What's so great about the Sider?

For starters, the Sider lets you boot your IBM PC® or PC/XT® directly off the hard disk—unlike some other Windows or subWindows. Reliability is also trouble-free. And the disk is partitionable, giving you a convenient way to organize your data, as well as access the information you store.

What's more, a small "bootstrap" lets you incorporate the compact Sider into your existing computer set-up with ease. In addition, with the Sider, you not only pay far less for the subwindow, you also save money on installation. Because, unlike other 10-MB systems that require the purchase of expensive "extra," the Sider is plug and play. Everything you need is provided, including cables, boot software, installation software and manual.

What makes it so reliable?

To start, the Sider is manufactured, and sold exclusively, by First Class Peripherals, an innovative computer company which is headed by Xerox. The company industry leading manufacturer of disk controllers. Xerox has over a decade of experience serving customers like IBM, Toshiba, Texas Instruments and Hewlett Packard. It's this kind of expertise that helps assure the Sider's performance.

Special dealer features further enhance reliability. The Sider's controller is the field-proven, industry standard Xerox SHANA. And Xerox's 3200 drive tester, the toughest in the industry, ensures every device made to keep the Sider operating reliably.

*See website disk for details.



"Only \$795?"

longer. A self-contained power supply also adds to dependability by eliminating the risk of heat build-up that could cut PC component life. One more assurance of the \$795 Sider's quality: it's UL Approved and FCC Class B rated.

But why is it only \$795?

You pay less for the Sider than for other 10-MB hard disks simply because you're paying for the superior quality components inside the unit, not for a lot of retail overhead costs. Since First Class Peripherals sells direct, you avoid dealer and dis-

tributor expenses, and pay only for the product.

tributor expenses, and pay only for the product.

What about a guarantee?

Like many experienced PC users, you may be reluctant to buy a hard disk priced at only \$795 without first seeing it in person. Here it performs. That's why First Class Peripherals offers you a reassuring, money-back guarantee that eliminates any risk on your part. Simply order the Sider and use it for 15 days. Then, if you're not entirely satisfied, return it and receive a full refund—no questions asked.

The Sider also comes with a full one-year limited warranty. Plus, there's a convenient, toll-free hotline you can call anytime you have a technical or service question, or need help.

**Don't delay.
Order the Sider now.**

To receive the Sider 10 megabyte Winchester hard disk subwindow for only \$795, simply order using the coupon below. For faster service, order by phone and charge to your VISA, MasterCard or American Express. (You can also call us if you have any questions or technical concerns about the Sider. We'll see you get the help you need.) Call toll-free:

1 800 538-1307

Extension 111

☐ Yes, please send me the Sider, including full-height 10 megabyte Winchester hard disk drive, IBM interface adapter board, cables, complete installation software and documentation.

I prefer to pay by bill:

☐ I've enclosed my check or money order for \$795 + \$15 shipping and handling, payable to First Class Peripherals.

☐ Please bill the following credit card account for \$795 + \$15 shipping and handling:

☐ VISA ☐ MasterCard ☐ American Express

Card # Exp Date

Signature

* Residents of CA, NY and IL, please add appropriate sales tax.

Name _____
Address _____
City _____
State _____ Zip _____
Telephone (area code) _____
Mail to: **FIRST CLASS** 3779 Highway 10 East
Carmen, CA, NY 97118

YOUR TEXAS INSTRUMENTS SOURCE



1-800-221-1127

1-202-276-6200 1-415-951-2000
1-202-276-6201 1-202-276-1700
1-212-269-6200 1-202-276-2000
1-212-276-6200 1-212-276-2000
1-202-276-1100

SPECIAL DEALER PROGRAM



IBM PC

Share IBM PC With Users of the Industry Model 80 PC

Share IBM PC With Users of the Industry Model 80 PC

WE CAN IMPROVE YOUR PROFITS THROUGH OUR DEALER PROGRAM

WESTWOOD COMPUTER CORPORATION

SCIENCE/SCOPE

In the 25 years since the birth of the world's first laser at Hughes Research Laboratories, the "light laser" has grown from a laboratory curiosity into an indispensable tool in medicine, industry, electronics, data processing, communications, and scientific research. That first laser, built by Dr. Theodore H. Maiman, was operated on May 15, 1960. It used a flash lamp coated around a solid ruby crystal to produce an intense pulse of red light with a wavelength of precisely 6943 angstroms. Lasers today employ various gases or crystals and operate throughout the electromagnetic spectrum. They are used as tools for cutting, welding, drilling, and marking metals; as alignment and measuring devices; as the sources of signals in fiber-optic communications systems; and as rangefinders and target illuminators in military systems. Promising new medical uses include advanced eye surgery techniques, internal coagulation, and treatment of cancer. Already used in some computer printers, lasers one day will be widely used in high-speed optical computers to process and store data.

Building blocks for what will become an electronics factory of the future are being set in place at Hughes to cut costs in manufacturing airborne radars and other avionics programs. Lasers, fiber optics, remote fiber fluorometry, and advanced optics play a part in an Industrial Modernization Initiative Program (IMIP) contract awarded by the U.S. Navy with Air Force participation. IMIP is a show-the-savings concept to reduce costs of the F-14, F-15, and F/A-18 radar programs by more than \$80 million, while improving the quality and reliability of the systems. Three projects employing new manufacturing technology focus on solder joint inspection, metal fabrication inspection, and continuous chemical analysis of solutions used in electroplating printed wiring boards.

An advanced factory management system model, developed by Computer Aided Manufacturing-International and Hughes, will help optimize use of manufacturing resources. The model will address interactions of all work areas within every level of the organization. It will precisely identify department production capacities, queue bottlenecks, and resource flow. Managers now must make decisions without knowing all interactions among workstations, cells, and departments.

Fine gold and aluminum interconnects in high-reliability gallium arsenide microcircuits can be bonded more efficiently with the new Hughes Model 2470 automatic wedge bonder. Designed for high-density pin grid arrays and complex microwave circuits, the computer-controlled ultrasonic bonder features a rotating bond head and digital pattern recognition and uses deep-access bonding tools. Gold or aluminum wire is fed vertically from a gas tensioning apparatus, eliminating the 30-degree feed and wire clamp used in conventional bonders. Its small "footprint" means that bond wires of 07 to 1.25 mils in diameter can be bonded to pads typically 2x3 mils on 3.5-mil centers.

Hughes Research Laboratories needs scientists for a spectrum of long-term sophisticated programs, including: applications of focused ion beams; electron beam circuit testing; liquid-crystal materials and displays; nonlinear optics and phase conjugation; submicron microelectronics; plasma applications; computer architectures for image and signal processors; gallium-arsenide device and integrated circuit technology; optoelectronic devices; and growth, characterization, and process technology development for new electronics materials for high-speed, infrared detection and optoelectronic applications. Send your resume to Professional Staffing, Hughes Research Laboratories, Dept. 53, 3001 Malibu Canyon Road, Malibu, CA 90265. Equal opportunity employer. U.S. citizenship required.

For more information write to: P.O. Box 10888, Dept. 50-4, Malibu and Dept. 53, 3001

IN DEPTH/MICROPROCESSORS

languages, applications and operating systems, that are more important and will eclipse the chip technology in an evaluation. Getting into the details of microprocessor features would normally be a consideration only when a long-range view of vendor products is being taken or when the user will be doing machine-level programming.

Chip technology will affect long-range suitability of products, because lack of a clear and easily supported migration strategy on the current chips will ultimately leave users stranded when better products become available.

None of the current 8-bit chips has a solid migration path; they rely on high-level language compatibility rather than machine-level compatibility. Anyone who uses Basic on several systems knows how compatible high-level languages are. The 16-bit chips, on the other hand, all offer a good path for

growth into 32-bit technology.

IBM's use of the Intel 8086 family in the Personal Computer is probably the most significant reason that the series continues to grow. If IBM should, at some point, decide to switch to another chip family, Intel's position in the market will probably weaken. It doesn't look as if that is about to happen, though, because IBM has moved to the 80286 with the IBM Personal Computer AT, running under both MS-DOS and Xenix.

Programming at the machine level is a good reason to consider the specific hardware. Most businesses will not find sufficient reasons to justify assembly language programming, but some special communications or device control applications may require it. There is no question that the Intel 8086 family is more difficult to program than the other 16-bit products; the segmentation architecture appears to cause misassembly and mainframe programmers more transition difficulties than the structures of the 68000.

Other factors may affect a programming task on microcomputers, however. Not all computers provide an assembly language (Macintosh does not), and some systems use an internal hardware architecture that restricts some of the features of the microprocessor. Don't select a computer because of the Motorola 68000 virtual memory addressing system to find that the computer vendor did not elect to supply memory management.

The microprocessor field is changing rapidly and growing more complex. Micro buyers may find themselves lured into excessive technical detail when evaluating systems. If your application really demands attention to the microprocessor itself, that level of consideration becomes justified. In most cases, it is not. Developing a basic understanding of microprocessors is desirable for anyone who intends to use or purchase microcomputers, but that understanding should not be allowed to draw business professionals so close to the technology that they forget the application. □

About the author
Stephanie Di Donato is a senior editor/analyst for Data Decisions, a market research firm.

This article was excerpted from Microcomputers, a three-volume monthly updated reference service that features hands-on test results for micro hardware and software products. Trial review copies are available from Data Decisions, 20 Bruce Road, Cherry Hill, N.J. 08034.

HUGHES

PROTO-TYPING

**IS: FAST
EFFECTIVE
PRACTICAL**

**IS NOT: NEW
MAGICAL
A SUBSTITUTE**

Fourth-generation software tools enable fully functional applications to be developed in the time it used to take to produce a system specification document. Here's how prototyping can complement the traditional system development cycle, not replace it.

By Lee Adamaki

Anyone involved in the development of computer applications has, at least once in his career, seen a tremendous effort go into the design of a system, complete with the latest structured design methodologies, exhaustive definition of requirements, reams of documentation and end-user sign-offs — only to have the final system turn out to be completely inappropriate for the needs of the users.

This is an extreme example of a system that did not meet its requirements. But really, how many systems are accepted and used as first designs? No matter how much planning and specification are done, what is the first thing that happens when a system finally becomes operational? Request for modification — Change. There always seems to be something designers forget.

Prototyping has been defined as the process of building and refining a working model of the final operational system during the development process. In fact, prototyping can mean anything from designing a hard-copy example of a computer report to creating a full-blown computer system

IN DEPTH/PROTOTYPING

77

Anyone who has ever been in the software vendor business knows what a traumatic experience it is to release a product.

Users cannot accurately specify systems until they have used them. Therefore, users should use the system before it's too late.

Anyone who has ever been in the software vendor business knows what a traumatic experience it is to release a product. The greatest minds in software development can produce a product that they think does everything that anyone would ever want it to do — then it's released.

Users, however, being the ingenious, devious people that they are, will find all kinds of ways to use it and abuse it, while uncovering all kinds of functions that it should be doing that its developers never dreamed of. This is because:

The primary obstacle to innovation is people, not methodology. Below are a few observations by well-respected experts in the systems development field. These statements suggest that there has been trouble specifying systems requirements and communicating effectively with users:

"The document setting out the details of a new system (system specification, general design, functional specification) effectively forms a contract between the user department and the systems development group, yet it is frequently impossible for the user to understand because of its sheer bulk and the technical concepts built into it."

"We have no way of showing a vivid, tangible model of a system to users. It's hard for users to imagine what the new system is going to do for them until it's actually in operation, by which time it's too late."

"By definition, and in any design, problem solving is a heuristic process — a process of trial and error. Anyone who fails to recognize this is doomed from the outset, either to outright failure or, at the very least, extreme frustration."

"Many of the most significant problems with systems work are related to simple, fundamental and early misunderstandings about what should happen and who is responsible for making those things happen. I suspect that most important bad decisions are made early. Surely improving the early communication will likely increase the chances for success of the entire project."

"In fact, the user is rarely capable of expressing his desires clearly, and the analyst must be capable of helping the user express his needs... The analyst must concentrate on the output of the systems process."

The first two quotes were taken from *Structured Systems Analysis: Tools and Techniques* (1977), written by Chris Gene and Trish Garver, and the remaining three were taken from *Structured Systems Development* (1977) by Kenneth T. Orr. What is apparent from these statements is that the problem of communicating with users and specifying systems requirements accurately has been realized for some time, and most methodologies have been attempting to solve it. But, in fact, these problems remain the major stumbling blocks in the systems development process.

The traditional systems develop-

ment cycle generally consists of several steps. These include:

■ A feasibility study, where the technical, operational and cost feasibility of a proposed system is determined.

■ A requirements definition phase, where the requirements that the system must meet are determined, documented and approved (the sign-off).

■ A design phase, where a physical solution to the requirements is determined. This phase usually pro-

ceeds from a general design to a exact specification for the construction of each system component.

■ An implementation phase, where the system is constructed, tested and verified.

■ A conversion phase, where a smooth transition from the current mode of operation to the new system is made.

■ A production phase, where the new system becomes the day-to-day operational system of the user group.

■ A maintenance phase, where

the system is continually enhanced and revised to meet the ever-changing needs of the users.

Some Limitations

Many systems that adequately satisfy user requirements have been designed and implemented using this traditional approach. However, more often than not, problems arise. As mentioned earlier, it's often very difficult for users to precisely state their total requirements completely.

Analysts document every detail as they understand it, using the latest systems development methodology (which they've learned by either studying a 400-page text on the subject or perhaps even attending a three-day workshop), produce a voluminous requirements specification document and then expect the user to read it, sign it and approve it.

How to advertise in every major computer market in the world as easily as you advertise in the U.S.

OW INTERNATIONAL Marketing Services will help you penetrate the most profitable computer markets worldwide — easily, effectively, and economically.

Your ads will receive the attention they deserve. Our network of more than 55 computer publications in 25 countries is the largest in existence. Over 9,000,000 computer involved people read our publications every month.

With more than 10 years' experience in international marketing, we're the only service of our kind. We can help you make your ads more effective. Our local offices can translate your ads for a 15% surcharge on the space you purchase.

We'll help you increase your market penetration. Because we place your advertising through our U.S. office, you won't have to pay the SAT (value added tax, ranging from 8-20% of your ad space purchases) which is regularly charged on all advertising placed abroad. And you'll be able to advertise in even more markets when you take advantage of our corporate discounts.

We're also available to advise you on your campaign strategy — such as when to advertise in order to coincide with special-focus issues and trade shows.

All you need to do is send us your advertising materials. We'll handle all the transactions. And we'll bill you in U.S. dollars so you won't have to worry about exchange rates.

Call Diane La Muraglia today if you want to reach the computer buyers in any of the following countries: Argentina, Australia, Brazil, Canada, Chile, Denmark, Finland, France, Greece, India, Israel, Italy, Japan, Korea, Mexico, Norway, People's Republic of China, Saudi Arabia, South Africa, Southeast Asia, Spain, Sweden, The Netherlands, United Kingdom, Venezuela and West Germany.

You can reach her toll-free at (800) 343-6474. In Massachusetts call (617) 879-0703. Or you can reach her through Telex, at number 96-1153. Or, if you prefer, fill out the coupon below and return it today. Do it now. The sooner we hear from you, the sooner you'll hear from our readers.



OW INTERNATIONAL MARKETING SERVICES, INC.

Diane La Muraglia
General Manager
OW International Marketing Services
276 Cochichewick Road, Box 880
Framingham, MA 01701

☐ Please send me more information about your International Marketing Services.
☐ Please have a sales representative call me.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Telephone _____

IN DEPTH/PROTOTYPING

Because of its sheer size and complexity, the document may simply be avoided by the user or, if he does make an attempt to study it, chances are he will not fully understand it. At some point, out of frustration or desperation, he signs off, and analyst and user move into the next phase of the systems development cycle.

Other problems are the time lags between the initial contact with the user and the production of the requirements document and between the approval of the specification document and the delivery of the system. During these time lags the following often happens:

■ Users forget details of preliminary discussions or lose interest and enthusiasm for the project.

■ Business conditions may have changed, which can have the effect

of making original needs obsolete.

■ Original users who requested the system may have left the company or been assigned to other responsibilities.

The final result is that the delivered system fails to satisfy the requirements of the user.

Several benefits

If, at this stage of the project, some of the effort normally put into producing the requirements definition is expended in building a model or prototype, several benefits can be realized:

■ The user gets immediate feedback from the analyst while his interest and enthusiasm in the project is still high. He sees tangible proof of progress.

■ A conversation piece is created that will stimulate a meaningful dis-

log between analyst and user.

■ The user can see, touch and work with the system rather than just read about it. His becoming actively involved in the development process and his enthusiasm increases.

■ Project communication is enhanced, and ambiguities are resolved early in the project—before it is too late.

Types of prototypes

The amount of effort expended in the prototyping phase can vary, based on the kind of prototype that is built.

In its simplest form, a prototype can be nothing more than a mock-up of system outputs. Sample reports and panel layouts are developed, and hard-copy representations are reviewed with the user. These will eventually become part of the de-

tailed system specification. For this, almost any interactive prototyping tool that allows an analyst to design menu options interactively and then produce hard copies can be used.

A somewhat more elaborate form of prototype is a throwaway functional model of the proposed system. This type simulates the functionality of the proposed system. Users can actually sit at a terminal and use the system as it would be used in its final form. Data entry, inquiry requests and traversal through program and panel hierarchies can be experienced. In addition, user-friendliness and man-machine dialogue can be evaluated.

A limitation of this prototyping method is that, as much as it looks like the ultimate system, it is still purely a model not capable of evolving into the final operational system. However, it is excellent for demonstrating the system and selling it to management. And the requirements to be communicated to the system specifications to the applications developers, but it eventually must be discarded. The final, operational system would have to be redeveloped in the source chosen to implement the system.

For a throwaway functional model, any interactive software tool capable of simulating a real system is adequate, as long as it can produce a model fairly quickly. Personal computer products are often used to produce these prototypes.

The third prototyping method, called an evolutionary system, has all the attributes of the throwaway type with the additional capability of evolving into the final system. This type has been made possible by current fourth-generation software tools.

Fourth-generation tools

Several software tools are needed to produce effectively a prototype capable of evolving into a finished product application. If the proper tools are not selected, the prototyping phase will be seriously hampered. The following is a list of basic tools required for efficient fourth-generation prototyping:

■ An active, integrated data dictionary capable of housekeeping information about all system entities, for example, programs, panels, reports, data elements and so forth. This dictionary becomes a single repository to document and control all system components.

■ An on-line screen-painting facility that is easy to use and capable of producing screens quickly that not only look like the desired panel but that can simulate the functions expected of the system.

■ A nonprocedural report generator that allows prototypers to specify report layouts quickly and produce hard-copy mock-ups of proposed reports.

■ A high-level, fourth-generation language that supports structured programming techniques, reduces or eliminates the complexity of coding and permits programs to be written and maintained quickly and interactively.

■ A query language capable of generating quick, ad hoc inquiries, also integrated with the data dictionary.

■ An automated documentation mechanism that automatically stores and maintains documentation as it is

What makes a revolutionary idea revolutionary?



First, it has to be new. Really new. STEAMER is new. It's an extremely powerful data compressor combined with a very efficient statistical multiplier. And it's about to revolutionize the data communications industry on its own.

Our data compression ratio is better than anyone else's. Nobody but nobody can produce better data compression efficiencies than we can with STEAMER. By using advanced statistical multiplying techniques which yield statistical efficiencies of about 6 to 1, and passing the statistically multiplied data through a proprietary algorithm, we get data compression efficiencies averaging 2.2 to 3.2:1.

That's significantly higher than anyone else's. And it means increased throughput and operating efficiency for you. Columbia may have changed the way people thought about the shape of the world. But we're changing the way the world thinks about data compression.

Proprietary compression algorithms: the heart of the matter. Our proprietary compression algorithm continually analyzes the incoming data stream on a port-by-port basis and compresses the most frequent strings into shorter strings. If the '48 Beetle taught people to think smart, we're teaching them to think smart.

Because the type and volume of data transmitted on a typical port in one direction on a link may be very different from the data transmitted in the other direction, or on other ports, STEAMER analyzes the data in each direction on a port-by-port basis and builds entirely independent compression tables. That ensures that maximum

compression efficiency is obtained. In fact, the STEAMER compression routine is so efficient, it virtually guarantees no additional delay added to response time. Our compression algorithm can compress or decompress 3,000 characters per second. That's the equivalent of a 14,400 BPS circuit operating at an 85% saturation rate in both directions simultaneously!

We compress the uncompressable. They said it couldn't be done. But we did it. In some graphics applications we get better than a 2:1 data compression ratio. We can even compress object code files. Which means that in addition to being an outstanding choice to ensure operational throughput and operating efficiencies, the STEAMER is really the only machine that can do all the following: remote file transfer, some graphics applications, computer to computer and computer to terminal communications on the same link, maintain system throughput even when modems must operate in full back mode because of line degradation, increase terminal quantity without scrapping the current modern investment, and relatively secure communications without the necessity of buying expensive encryption equipment.

Revolutionize your network today. Call 1-800-333-0600 now and we'll let you even more about STEAMER. And don't wait. STEAMERS are going to be in all other data communications and data compression machines will be the easy open pull top can did to can openers. Make 'em obsolete.

STEAMER may have changed the way people thought about the shape of the world, but we're changing the way the world thinks about data compression.

Proprietary compression algorithms: the heart of the matter.

Our proprietary compression algorithm continually analyzes the incoming data stream on a port-by-port basis and compresses the most frequent strings into shorter strings. If the '48 Beetle taught people to think smart, we're teaching them to think smart.

Because the type and volume of data transmitted on a typical port in one direction on a link may be very different from the data transmitted in the other direction, or on other ports, STEAMER analyzes the data in each direction on a port-by-port basis and builds entirely independent compression tables. That ensures that maximum

compression efficiency is obtained. In fact, the STEAMER compression routine is so efficient, it virtually guarantees no additional delay added to response time. Our compression algorithm can compress or decompress 3,000 characters per second. That's the equivalent of a 14,400 BPS circuit operating at an 85% saturation rate in both directions simultaneously!

We compress the uncompressable. They said it couldn't be done. But we did it. In some graphics applications we get better than a 2:1 data compression ratio. We can even compress object code files. Which means that in addition to being an outstanding choice to ensure operational throughput and operating efficiencies, the STEAMER is really the only machine that can do all the following: remote file transfer, some graphics applications, computer to computer and computer to terminal communications on the same link, maintain system throughput even when modems must operate in full back mode because of line degradation, increase terminal quantity without scrapping the current modern investment, and relatively secure communications without the necessity of buying expensive encryption equipment.

Revolutionize your network today. Call 1-800-333-0600 now and we'll let you even more about STEAMER. And don't wait. STEAMERS are going to be in all other data communications and data compression machines will be the easy open pull top can did to can openers. Make 'em obsolete.

STEAMER may have changed the way people thought about the shape of the world, but we're changing the way the world thinks about data compression.

Proprietary compression algorithms: the heart of the matter.

Our proprietary compression algorithm continually analyzes the incoming data stream on a port-by-port basis and compresses the most frequent strings into shorter strings. If the '48 Beetle taught people to think smart, we're teaching them to think smart.

Because the type and volume of data transmitted on a typical port in one direction on a link may be very different from the data transmitted in the other direction, or on other ports, STEAMER analyzes the data in each direction on a port-by-port basis and builds entirely independent compression tables. That ensures that maximum

compression efficiency is obtained. In fact, the STEAMER compression routine is so efficient, it virtually guarantees no additional delay added to response time. Our compression algorithm can compress or decompress 3,000 characters per second. That's the equivalent of a 14,400 BPS circuit operating at an 85% saturation rate in both directions simultaneously!

We compress the uncompressable. They said it couldn't be done. But we did it. In some graphics applications we get better than a 2:1 data compression ratio. We can even compress object code files. Which means that in addition to being an outstanding choice to ensure operational throughput and operating efficiencies, the STEAMER is really the only machine that can do all the following: remote file transfer, some graphics applications, computer to computer and computer to terminal communications on the same link, maintain system throughput even when modems must operate in full back mode because of line degradation, increase terminal quantity without scrapping the current modern investment, and relatively secure communications without the necessity of buying expensive encryption equipment.

Revolutionize your network today. Call 1-800-333-0600 now and we'll let you even more about STEAMER. And don't wait. STEAMERS are going to be in all other data communications and data compression machines will be the easy open pull top can did to can openers. Make 'em obsolete.

STEAMER may have changed the way people thought about the shape of the world, but we're changing the way the world thinks about data compression.

Proprietary compression algorithms: the heart of the matter.

Our proprietary compression algorithm continually analyzes the incoming data stream on a port-by-port basis and compresses the most frequent strings into shorter strings. If the '48 Beetle taught people to think smart, we're teaching them to think smart.

Because the type and volume of data transmitted on a typical port in one direction on a link may be very different from the data transmitted in the other direction, or on other ports, STEAMER analyzes the data in each direction on a port-by-port basis and builds entirely independent compression tables. That ensures that maximum

compression efficiency is obtained. In fact, the STEAMER compression routine is so efficient, it virtually guarantees no additional delay added to response time. Our compression algorithm can compress or decompress 3,000 characters per second. That's the equivalent of a 14,400 BPS circuit operating at an 85% saturation rate in both directions simultaneously!

We compress the uncompressable. They said it couldn't be done. But we did it. In some graphics applications we get better than a 2:1 data compression ratio. We can even compress object code files. Which means that in addition to being an outstanding choice to ensure operational throughput and operating efficiencies, the STEAMER is really the only machine that can do all the following: remote file transfer, some graphics applications, computer to computer and computer to terminal communications on the same link, maintain system throughput even when modems must operate in full back mode because of line degradation, increase terminal quantity without scrapping the current modern investment, and relatively secure communications without the necessity of buying expensive encryption equipment.

Revolutionize your network today. Call 1-800-333-0600 now and we'll let you even more about STEAMER. And don't wait. STEAMERS are going to be in all other data communications and data compression machines will be the easy open pull top can did to can openers. Make 'em obsolete.

STEAMER may have changed the way people thought about the shape of the world, but we're changing the way the world thinks about data compression.

Proprietary compression algorithms: the heart of the matter.

Our proprietary compression algorithm continually analyzes the incoming data stream on a port-by-port basis and compresses the most frequent strings into shorter strings. If the '48 Beetle taught people to think smart, we're teaching them to think smart.

Because the type and volume of data transmitted on a typical port in one direction on a link may be very different from the data transmitted in the other direction, or on other ports, STEAMER analyzes the data in each direction on a port-by-port basis and builds entirely independent compression tables. That ensures that maximum

STEAMER

On March 4, 1985 Datagram revolutionized the data communications industry with STEAMER.



Datagram We make networks work harder.

Where can you find
a powerful
data processing system
that integrates voice,
uses multiple operating systems,
and delivers voice and data
at 2.56 Mbs to the desk
over twisted pair
telephone wire?

Northern Telecom invites you

The Meridian DV-1 DataVoice System.
A direct result of our commitment to OPEN World
and the simultaneous integration of data,
voice, text and graphics.



to meet on the Meridian.



IN DEPTH/PROTOTYPING

developed during the prototyping process, with the capability to generate hard copy easily and as needed.

6. A data base management system capable of modeling all required file and data structures. The DBMS should support data modeling, facilitate data access to applications and provide physical data structure independence.

In general, good prototyping software should be integrated, available from one

workstation, easy to use, menu-driven and command-driven, accessible to and usable by end users, self-documenting, portable and usable in the final, operational system. It should also permit quick modification and reassembly and support multiple versions of system entities.

Guidelines for use

Not all systems are good candidates for prototyping. Batch systems, systems that are highly algorithmic and

have few data elements and nonpredictive systems are generally poor candidates for prototyping.

Systems that are highly interactive with significant man-machine dialog, that employ a high degree of data manipulation and record management and that are predictive in nature are generally good candidates. The typical management information system usually works fine.

User participation is an

other key ingredient and cannot be underestimated. Active contribution on the user's part is mandatory for the success of the project. A prototype that is constructed behind closed doors, regardless of how clever the prototypers are, is no better than a requirements document that falls to communicate the user's needs. The user is the primary catalyst to the success of the prototype.

The prototyping process can be broken down into six

basic steps:

1. **Initial user consultation.** The process begins with the initial user contact, where a general understanding of system requirements is determined. Basic outputs, existing problems and so on are reviewed.

2. **First-cut outputs.** The analyst immediately documents his understanding of the requirements of the system by building models primarily of the outputs of the system. Sample report and screen layouts are built using the appropriate prototyping tools. Remember, this is all based on the initial user-analyst meeting.

3. **User review.** The sample outputs are reviewed with the user. A refining process begins. Omissions are pointed out. Misunderstandings are cleared up. Outputs may be consolidated, or the need for additional system outputs may become obvious.

4. **Prototype modifications.** Changes suggested by the user in Step 3 are implemented by the analyst. The analyst himself makes modifications and reviews them with the user. Often, Steps 3 and 4 are combined and executed by the user and analyst. These two steps may be repeated several times, until a mutually acceptable agreement between analyst and user is reached. At this stage of the project, changing can occur. The analyst must prevent this from happening by establishing a defined scope with reasonable time constraints. Without this necessary restriction, the refinement process could go on forever. At some point, the process must stop, and the decision must be made to go ahead.

5. **Data structure evolution.** During the process of defining outputs, the data needed to support the operation becomes evident. This is the signal to start building data structures. Initially, one large flat file will suffice. The objective at this point is to have the data necessary to provide the outputs desired. The source of the data and normalization may occur later. Physical, test data bases can be built at this time, but they are not necessary. Data can simply be defined internally in programs to simulate real data bases.

6. **Code program shells.** Programming can begin, but in a very high-level fashion. A simple driver program to simulate screen traversal is a good starting point. High-level program shells that contain narrative documentation or pseudocode and stubs, rather than actual code, could be developed. Many fourth-generation languages closely resemble pseudocode and can be converted quite easily to actual code when used in the implementation of the final

Novell introduces the best way to improve your network reception.

In a relatively short time, the local area network (LAN) market has attracted a host of suppliers. Each has a LAN system to sell. And each is fighting for the local piece of the LAN pie.

Amid all these LAN contenders, only one company is out to make all LAN systems perform better. Only one company offers high-powered LAN operating system software that improves the performance of every major LAN system on the market. Only one company is finishing the job the other LAN makers begin.

The company is Novell. The company's solution is NetWare.

NetWare performs.

How good is NetWare? In recent benchmark tests conducted by Novell as well as Balabant Laboratories, NetWare significantly improved the performance of

every LAN system tested.* In fact, NetWare currently runs on 34 different LAN hardware systems, outperforming the original software for every one.

Serving all LANkind.

Whichever LAN hardware you choose, NetWare is the LAN software designed to get the most out of your network. When it's time to improve the reception your network gets from those who use it every day, plug into NetWare. It's from Novell, the people dedicated to serving all LANkind.

For more information, call or write Novell, Inc., 1170 N. Industrial Park Drive, Orem, Utah 84057 (801) 225-8200.

*LAN Benchmark Report, May, 1985, Novell, Inc. and "Software, Not Hardware Key to LAN Performance," PC Week 1/15/85.

NOVELL

IF ANY 3M, MAXELL, OR DYSAN FLOPPY DISK FAILS, WE'LL REPLACE IT WITH A NEW VERBATIM DISK. FREE.

Most floppy disks come with a guarantee; if they ever fail, the manufacturer will send you a brand new one. But let's face it; if a particular brand of floppy disk ever loses your data, you might not want another one of theirs.

That's why Verbatim is offering a very special guarantee: If you buy a 3M, Maxell, or Dysan floppy disk — and it fails — we will replace it with a brand new Verbatim disk. Free. Why are we making this offer? Because we think it's time you use a floppy disk you can always count on. Verbatim.



© 1985 Verbatim Corporation

VERBATIM YOU CAN COUNT ON US.

Mail your failed 8" 5¼" or 5¼" disk in its original envelope, along with your name and address, and the brand and model of your computer system, to: Verbatim Offer, P.O. Box 7906, Clinton, IA 52736. Limit one refund per name and address. Offer limited to the first 100,000 3M, Maxell, or Dysan failed disks received. Offer expires October 1, 1985. Void where prohibited by law. Offer rights are not assignable or transferable.

IN DEPTH/PROTOTYPING

operational system.

Once the prototype is complete and the analyst and user have come to a reasonable agreement regarding system requirements, the more traditional activities of the systems development cycle, that is, those not revealed by the prototype, are undertaken.

What to do now

The prototyping phase was only concerned with system functionality and with the I/O of the system. The less visible aspects of the system must now be dealt with and documented. Hardware and software used to implement the system must be decided upon. Detailed capacity planning and system sizing must be performed. Transaction rates must be determined. Frequencies and volumes must be specified and perfor-

mance considerations, such as a reasonable response time, must be agreed upon.

Other concerns not addressed by the prototype include security procedures, backup/recovery, conversion, system testing and implementation plans, user sites, system reliability, audit trails and controls and documentation and training.

In the data base area, the DBMS must be chosen. Data must be normalized, logical views completed and data items finalized. Source of input to the language and procedures for populating the data bases must be determined. In the area of programming, standards must be established regarding module sizes, procedure labeling, help facility, messages, PF key usage, panel and report layout consistency and so on.

Programs developed in the proto-

typing process that will be used in the final system must be cleaned up and have rigid, structured programming techniques and guidelines applied to them.

What happens to the prototype is another question that comes up at this time. If it is the type that is not capable of evolving into the final system, it can simply serve as the model or requirements tool for the actual development of the real system. If programs were already written, they can simply be rewritten in the language chosen for implementation. Again, it is much easier to take an existing program and reprogram it than to start from scratch.

The prototyping process is often very enlightening. After the process is complete, it may be decided to discard the prototype and abandon the project or to cease system devel-

opment and purchase a vendor-supplied solution. The prototyping process may simply have uncovered the fact that the proposed system is really not feasible or at least not cost-justifiable at this time. In these instances, it is better to realize this now rather than after the system is implemented.

Finally, if the prototype was developed with a tool capable of evolving into the final system, its future must be decided upon at this time. If it still meets the requirements of the system after the operational and performance constraints have been applied, it should become the final operational system. If not, it should be examined to determine if it can be salvaged or refined to be used in the final operational system.

Often, only a small portion of the prototype system must be revised using an alternate implementation tool to make the prototype a usable system. The screens and many programs may be used as they are.

A little more should be said about choosing the proper tools to implement the system. There is an such thing as the perfect tool. Each has advantages and disadvantages. However, some are more appropriate than others. The best systems are those that are implemented using the appropriate tools.

Today there are more varieties of software than candy in a candy shop. It is not unusual to see an application written in several languages. The main driver programs may be in a fourth-generation language, while subroutines are written in PL/I, Cobol or assembler.

During the era of second and third-generation software, shops were considered as assembler shops, RPG shops, Cobol shops and so on. This is not the case anymore.

The problem today is that people are attempting to carry this second and third-generation mentality into the fourth generation. Often, the decision to use a specific tool for an entire application is made when some portions would be more appropriate for an alternative software language or tool. People are using tools for the wrong purpose. A fourth-generation language — chosen to realize productivity gains in the applications development phase — is then expected to outperform traditional languages. This is impossible.

The days of RPG, Cobol and assembler shops are over. The computer professional of today must be knowledgeable in several software tools and languages — and, more importantly, must choose the appropriate tool to solve today's problems.

Prototyping, like any other software development aid or tool, has advantages and disadvantages. It can be used or abused. It is simply another tool to be used in the systems development cycle.

Prototyping is not an excuse to abandon traditional techniques and methodologies like water. It is not appropriate in all situations. If used properly, however, it can be a most effective aid in developing systems that truly meet the needs of users.

About the author

Lee Adelman is manager, Ideal Consulting and Education, of Applied Data Research, Inc. (ADR) of Princeton, N.J. Prior to joining ADR, Adelman worked for Sperry Corp. as a systems education consultant.

I'm buying

3RD ANNUAL PC EXPO ADVANCE REGISTRATION

NEW YORK COLLEGIUM JUNE 17-19 1985

PC EXPO

NAME _____

COMPANY TITLE _____

COMPANY ADDRESS _____

CITY _____ STATE _____ ZIP _____

MAIL STOP # _____

TELEPHONE _____

PC EXPO attendees must be qualified. Please check one box only in each of Plots 1 and 2 or Plots 3 and 4. (Others may not register.)

PLOT 1 - NON-TECHNICAL PERSONNEL		PLOT 2 - TECHNICAL PERSONNEL	
1. <input type="checkbox"/> I am a user of a personal computer.	2. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	3. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	4. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.
5. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	6. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	7. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	8. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.
9. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	10. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	11. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	12. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.
13. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	14. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	15. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	16. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.
17. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	18. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	19. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.	20. <input type="checkbox"/> I am a user of a personal computer and I am interested in learning more about the PC EXPO.

Check box to receive free PC EXPO Values Report Guide.

MICROCOMPUTERS

Phillipe Kahn

Borland boss takes unconventional route on the road to micro software success

By Kathleen Sullivan
CW West Coast Bureau

SCOTT'S VALLEY, Calif. — Two years ago, in a small office over a garage, Borland International was planning a media campaign to launch its first product, a Pascal compiler called Turbo Pascal. But the fledgling firm was operating under severe financial constraints. It was broke.

The company's founder, a former math instructor from France named Phillipe Kahn, wanted to run an advertisement in a particular magazine. But he knew that the magazine, a small systems publication based in New Hampshire, would expect \$9,000 up front. The situation, Kahn decided, called for a ruse.

See KAHN page 52



Users applaud Reflex tools

By Paul Kornaczewski
CW Staff

Early users of Analytica Corp.'s Reflex, a data base management package that runs on the IBM Personal Computer, said the package provides financial analysis functions that competing software cannot.

"There was no data base management package that met my requirements," noted David Mainberg, director of new technology at McKesson, Inc. of San Francisco.

"Most data bases merely store data and do not allow one to analyze it. With those packages, I was unable to build a data base that worked as a financial model. Reflex allows one to group data in various ways and then produce a series of charts or graphs that can be used for analysis."

Announced last November, the data base includes spreadsheet and graphics capabilities that allow users to perform

See REFLEX page 55

Zenith boosts microcomputer line

GLENVIEW, Ill. — In a move that other vendors often spread over several years, Zenith Data Systems Corp. this week will announce five personal computers, each running Microsoft Corp.'s MS-DOS operating system and targeting a different segment of the personal computer market.

Two machines, the 14.5-lb Z-171 and the 24-lb Z-138, will be targeted at the transportable market. For entry-level buyers, Zenith will unveil the Z-148, a 128K-byte machine priced at \$2,199 with dual-dis-

kette drives. For those who want a more powerful system, an enhanced version of its Z-150, sporting an 8-MHz clock speed (nearly twice that of its older brother), will debut. And for the uppermost strata of the personal computer market, Zenith will introduce its Z-200, said to be compatible with the IBM Personal Computer AT (CW, April 29).

With its LCD screen, flip-down keyboard and twin, vertical diskette drives,

See ZENITH page 54



SMALL TALK
Eric Bender
CW Staff Writer

Memory scheme set as showstopper

The first public demonstration of the expanded memory scheme cooked up by Lotus Development Corp. and Intel Corp. begins today on the show floor at Comdex/Spring in Atlanta. The architecture gives suitably outfitted IBM Personal Computers running under PC-DOS more than 640K bytes of directly addressable random-access memory (RAM)—up to 4M bytes of additional RAM for standard Personal Computers, up to 8M bytes for the Personal Computer AT—with only about 2% performance degradation, claimed Mitchell Kapor, Lotus chairman.

Published as the Lotus/Intel Expanded Memory Specification, the approach is

See MEMORY page 55

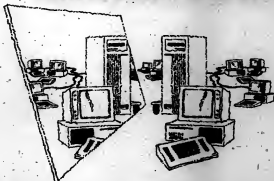
■ Tandy unwraps a local-area network for IBM Personal Computers, Tandy micros and other MS-DOS machines/64

■ Lotus unveils a report writer for its 1-2-3 package/67

■ Detacopy announces packages that enhance its Word Image Processing System/69

■ Morrow introduces a battery-powered IBM-compatible portable with a 25-line screen/68

Mirrored Hardware



Unmatched System Reliability

A mirror image of your data. Just what you need to assure yourself of reliable data reliability transmitted and reliably received. NESTAR's engineers assure the reliability of your system—and your data—by designing our products such features as tape backup for hard disk files, automatic checkpoints on formatted disks, full checksums, and mirroring of the server.

Bankers trade and transfer billions of dollars every day. They demand a network that stores, transfers, and retrieves data reliably. Bankers trade and transfer their billions of dollars every day over NESTAR networks.

Call or write for your copy of:

"Executive Briefing"
2565 East Shattuck Road,
Palo Alto, CA 94303
(415) 493-2223

Local Area Networks For Large Organizations

NESTAR



MICROCOMPUTERS

Borland continues to expand wares

When it first appeared on the market, Borland International's Turbo Pascal — a high-speed compiler and language development environment for Intel, Intel's 8086 and Intel Corp.'s 80286 and 80386 microprocessors — was seen as a major step forward for the language.

The Turbo family now includes Turbo 87, a Turbo Pascal program with Intel's 8087 support for 80386 microprocessors; Turbo Vision, a windowed graphical development environment; Turbo Pascal, a Pascal program development tool that compiles Turbo Pascal and Turbo Pascal's TurboPascal, which provides graphical programming for use with Turbo Pascal.

Last January, Borland introduced Borland's new application program, priced at \$49.95. Designed for the IBM Personal Computer and compatibles, Borland's is a disk-copying program that includes a catalog, a scheduler, an appointment calendar, an automatic telephone dialer and a word processing tool.

In February, the firm began shipping SuperKey, a keyboard enhancement program priced at \$49.95. With SuperKey, users can program a single key to replace often-used commands.

What's next for Borland? The firm is now working on Borland's Plus, a successor to Borland's existing Turbo Pascal Plus, a successor to Borland's Turbo Pascal. In addition, the company is developing language tools for C, Modula-2 and Basic, to add. Looking to expand revenue, Kahn added the firm is not neglecting a Lotus Development Corp. 1-2-3 beta-version or an Adobe Type II/III II class.

KAHN from page 51

So Kahn designed a phony flip chart that listed the top business and computing magazines of the day, with notes on how large an ad the firm planned to take out in each. "Business Week — double spread," read one page. While the target magazine was included on the chart, it had been crossed out.

Kahn enlisted a friend to play his secretary, and instructed her to interrupt his meeting with the target magazine's salesman with the message that a large Japanese firm wanted to order one million copies of Turbo Pascal.

When the salesman arrived, he noticed the chart and asked Kahn why his magazine had been crossed out. Kahn feigned embarrassment and apologized, saying his staff should not have left the chart out. When his "secretary" told him that a Japanese firm was on the line, he left to take the call in an adjoining room. There, watching through a peephole drilled for the occasion, Kahn saw the salesman staring with bewilderment at the chart.

When Kahn returned, the salesman had been snared. He volunteered to give the Turbo Pascal advertisement special placement at a reduced rate and, most importantly, gave the firm two months to pay. Kahn, pretending to be reluctant, agreed.

Turbo Pascal, sold through mail order, went on to achieve remarkable success, analysts said. Jan Lewis, a senior analyst with Infocorp, a Cupertino, Calif.-based market research firm, said the release of Turbo Pascal resulted in a ground swell of grassroots support for the young firm.

According to Kahn, more than 300,000 copies of the \$49.95 program have been sold since late 1983. Turbo Pascal gave Borland a solid financial footing for marketing other products (see story left).

Kim Evans, an industry analyst at Dataquest, Inc., a San Jose, Calif.-based market research firm, estimated that privately owned Borland took in \$10 million in revenue in 1984.

The original Turbo Pascal ad, now framed,

hangs in the firm's conference room. Borland's ads, which are long on information and short on style, have become a trademark of sorts for the firm. "Their ads might not be elegant, but they are effective," Lewis said.

Although his days of hoodwinking unsuspecting salesmen have passed, Kahn continues to champion an unconventional approach to business, which extends to his style of dress. At a recent interview, Kahn sported bright red corduroy slacks and a flowered Hawaiian shirt.

When asked to describe the firm's philosophy, Kahn, who worked his way through college playing the saxophone in French jazz clubs, paraphrased American jazz musician John Coltrane. "Coltrane once said, 'Damn the rules. Any way you play it, it's the same 12 notes,'" Kahn said.

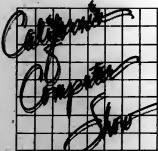
Champion of functionality

Unlike other firms that emphasize the importance of marketing, Borland champions functionality. "We sell useful software at rock-bottom prices," Kahn said. "We are customer-oriented first. We are product-oriented and technology-driven. Marketing comes after that."

At a time when experts said there was no market for the programming language, Kahn built a prosperous firm on the shoulders of a Pascal compiler, said Scott Tiernan, who sits on the board of the Software Entrepreneurs' Forum, a Palo Alto, Calif., group. "He has shaken up an industry that really was closed to the little developer," Tiernan said.

Tiernan added that independent software developers regard Kahn as a hero. "Everyone likes to see someone who becomes successful, especially when they're going against the grain," he said.

Dataquest's Evans attributed Borland's accomplishments to the company's ability to provide "excellent technically oriented products" to a specially targeted audience — the technical, scientific and student markets. "It's a significant part of the market, and we need to have not been addressed to the fullest extent," she said.



May 14th - 15th, 1985
12:00pm - 6:00pm
Palo Alto Hyatt Hotel
4290 El Camino Real
Palo Alto, California

Northern California's only TWO-DAY event dedicated exclusively to OEMs and sophisticated end users.

Featuring the latest in:
CAD/CAM Systems
Graphics Systems
Engineering Workstations

Computers and Peripherals
Data Communications
Unix

Exhibiting Companies and Product Lines:

AT & T
Daisy
DEC
Fujitsu
IBM

Intel
Mentor Graphics
Metheus
Motorola
Perkin Elmer

Sun Microsystems
Tektronix
Valid Logic
Versatec
and many more...

Call or write for a complimentary invitation to:

NORM DE NARDI ENTERPRISES

289 So. San Antonio Rd., Suite #204 • Los Altos, CA 94022 • (415) 941-0440



Reach over 5,000 computer professionals in Venezuela.

Advertise in *Computerworld Venezuela* and sell your products directly to Venezuela's thriving computer community. According to International Data Corporation (IDC), the world's leading information industry research firm, Venezuela is the third largest computer market in Latin America. And, annual EDP expenditures in Venezuela are approximately \$1 billion (U.S.).

Your ad in *Computerworld Venezuela* reaches 5,000 MIS/DP computer professionals throughout Venezuela, including MIS managers, DP staff and computer equipment suppliers. Published every other Monday, *Computerworld Venezuela* reports on the latest developments in hardware, software, terminals and supply products.

CW International Marketing Services makes advertising your products in Venezuela, and around the world, easy. We have over 50 publications in more than 25 countries. For more information on our wide range of services, call Diane La Muraglia, General Manager, at (800) 343-6474. In Massachusetts call (617) 879-0700. On the West Coast call Isabella Barboglio at (415) 328-4602 or (800) 227-8365. Or fill out and return the coupon below.

Fill out and return information on:

☐ *Computerworld Venezuela*
☐ Your other foreign publications

Name _____
Company _____
Address _____
City _____ State _____ Zip _____

**Infotron's concept for network growth
opens the world for you.**

**Our concept for network management
puts it at your fingertips.**



**Centralized
network
management.**

As your network
grows—linking
offices, cities or
countries—you can

centralize monitoring and control
functions through the ANM-800
Advanced Network Manager.

A central console controls up to
32 remote nodes. User-friendly
color graphics help you tell at a
glance the real-time status of the
entire network. Archiving of perfor-
mance information enables you to
fine-tune your network and plan
future growth.

Working with information from
Infotron's 790 and 792 Network
Concentrators, the ANM-800 pro-

vides diagnostics, alarms and event
reporting. All designed to help you
pinpoint problems and take correc-
tive action.

**Flexibility and growth:
about ANI.**

The ANM-800 is a key component
of Infotron's Advanced Network
Integration, a concept for network-
ing growth that means the Infotron
equipment you buy now will never
be obsolete. ANI also gives you the
flexibility to extend your network,
expanding and reconfiguring as
your needs change.

And our systems support pro-
vides the help you need—from
engineering assistance to training
to worldwide field service—to ensure
ongoing network performance.

To find out more, send the

coupon to Infotron Systems
Corporation, Marketing Depart-
ment, 9 North Olney Avenue, Cherry
Hill, NJ 08003. Or call toll-free
1-800-345-4636.

**Infotron. First in
performance and reliability.**

Please send me more information ON 54
about ANI™ products, and the
ANM-800 Advanced Network Manager.

Name

Title

Address

City State Zip

Telephone

See us at ICA

Booth 2525

INFOTRON SYSTEMS

MICROCOMPUTERS

HP launches hardware, software for micro OA

By Jeffrey Sacher
OF West Coast Bureau

PALO ALTO, Calif. — Hewlett-Packard Co. late last month moved on both hardware and software fronts to make its personal computer line more useful in office automation.

On the hardware side, the firm extended its Touchscreen microcomputer family with the introduction of two desktop processors that provide larger display screens and more I/O capacity than their HP predecessors.

On the software side, six additional modules were added that reportedly reflect HP's desire to encourage

use of the Touchscreen machines as stand-alone micros rather than as terminals. The six packages include: HP Access, a Touchscreen-resident application that reportedly simplifies the task of extracting data from host CPUs or micros and allows users to download the material for local processing.

HP Application Link, an Access-like product that extends the company's existing financial applications by permitting accounting data to be retrieved remotely from HP 3000s and downloaded to Touchscreen PCs. See HP page 60

Tandy introduces micro net

FORT WORTH, Texas — Tandy Corp. has announced a personal computer local-area network that requires no dedicated file server.

The Vianet network reportedly will link IBM and Tandy personal computers and other "machines" computers running Microsoft Corp.'s MS-DOS operating system. Each micro will gain equal access to the network's resources. Vianet will be based on the Datapoint Corp. Arcnet token-passing data-link hardware.

Vianet reportedly needs no central, dedicated computer to function as a server and has a fully distributed architecture and simple command structure. If one personal computer in the network fails, the network will

remain up, Tandy said.

Vianet users reportedly will be able to share applications software and any data or printers normally accessed by that software. The Tandy network also emulates Microsoft MS-DOS 2.1 record-locking calls, allowing multitier applications to run without modifications.

Vianet interface boards — with network software — for Tandy Models 1000, 1500, 2000 and other IBM Personal Computer compatibles cost \$499.95. An active hub for the network costs \$699.95. A passive hub costs \$69.95.

Tandy is located at 1800 One Tandy Center, Fort Worth, Texas 76102.

ZENITH from page 51

the Z-171 may be the most eye-catching machine of the group. The resemblance of the \$2,699 Z-171 to Morrow, Inc.'s Pivot is no accident, according to Zenith Marketing Vice-President John Frank.

The Z-171, Frank said, is the result of a joint venture with Morrow in which Zenith enhanced the Pivot's basic design to include a back-lit, 25-line display, a pressure-sensitive function key template and optional support for a VDT. The machine will ship in June and is based on the Harris Corp. 80C86, a Cmos chip with reduced power requirements.

The other transportable in the rollout, the Z-138, is "25% lighter than most CRT-based (transportable) on the market," Frank said. Based on the Intel 8086 chip, the standard Z-138 includes a 7-in. Zenith Chromagold amber display; detached keyboard; 128K bytes of memory (expandable to 640K bytes); one 360-psi, 5¼-in. diskette drive; and MS-DOS 2.11 and 1.25. It costs \$2,299. A dual-drive, 256K-byte unit costs \$2,599. Both will ship in July.

For the low end of the desktop market, the Z-148 reportedly offers in its standard version one 360K-byte diskette drive, 128K bytes of memory, serial and parallel ports, detached keyboard and MS-DOS. It costs \$1,999. A dual-drive unit costs \$2,199. Both will ship in July.

The enhanced Z-150, called the Z-158 series, reportedly is based on the Intel 8086 processor but operates at a clock speed of 8 MHz instead of the 8086's standard 4.77 MHz. As a result, applications execute 60% faster, Zenith said. For timing-sensitive Personal Computer software, a switch reduces the clock speed to 4.77 MHz. Machines in the Z-158 series will include a single-drive model, priced at \$2,499; a dual-drive model, priced at \$2,899; and a dual-drive unit with an internal 10M-byte disk, priced at \$4,099. Delivery of Z-158 series machines will begin in July.

Zenith also is introducing a line of monochrome monitors that use what Zenith called nonglare technology to reduce reflections. A 12-in. model, with either an amber or green screen, will cost \$199. An amber screen, 12-in. monitor with what Zenith called an improved contrast element will round out the line. It costs \$229.

Zenith Data Systems, a subsidiary of Zenith Electronics Corp., is located at 1000 Milwaukee Ave., Glenview, Ill. 60025.



CONFIDENTIAL

The #1 3270 alternative for people who need a name they can trust.

Sooner or later, the search for truly compatible low-cost 3270 terminals, better service and product flexibility comes

to a question of confidence. And nobody answers the question better than Telex.

Who is Telex? The #1 supplier of 3270 alternatives. Next to IBM, nobody sells more 3270 displays, printers, controllers and intelligent workstations than Telex.

Why Telex? Because Telex terminals are a lot more than just 3270 plug compatible. Product for product, they offer

MICROCOMPUTERS

REFLEX *from page 51*

"what-if" functions with their data. "We have to analyze data in different ways so we know where and when to sell different products," noted Robert Dufala, assistant vice-president at Crocker National Bank in San Francisco. "Reflex stores historical performance and sales data and provides the tools needed to analyze it."

Reflex had to supply a number of mathematical functions to analyze the data. "A number of data base packages allow a user to include simple equations in a report or a data base," said James Washagen, sales administration manager at Cerox Co., an Oakland, Calif., manufacturer of household products. "Reflex provides sophisticated statistical features such as the ability to add or multiply columns."

Malmberg, a beta test user of the package, has worked with Reflex since November, monitoring the performance of various McGraw-Hill subsidiaries, such as its liquor distributor with 40 facilities.

"We have a number of suppliers for various brands of liquor," he explained. "Reflex allows us to monitor the financial performance of each supplier. With the package one can examine a physical record, translate the data into a graph and produce a number of charts."

At Cerox, Reflex supplements Information Builders, Inc.'s Focus. Washagen downloads Archi files from Focus and loads them into Reflex to produce graphs and reports that help monitor sales performance.

Before finding Reflex, Washagen had searched through a number of other data base packages for one that

met his needs. These packages included Information Builders's PC/Focus, Microtin, Inc.'s R-Base 4000 and Micro Data Base Systems, Inc.'s Knowledgeman.

For Malmberg, Lotus Development Corp.'s 1-2-3 was inadequately fulfilling functions that are now completed with Reflex. "After one builds a Lotus model, he can just examine how various input would affect output," he said. "Reflex allows one to build different types of models and look at data in different ways."

The beta users claimed that Reflex was easy to operate. "The package's pull-down menus and Help screens alleviate training woes," Washagen said. "The package is much easier to work with than something like [Lotus] Symphony, which has five or six layers." Users said they were operating the product a few hours after re-

ceiving it and were constructing complex data base models in a few days.

Complaints about the product were few. Reflex did not supply relational capabilities, Washburn noted, as that users are unable to link files. A second complaint focused on Reflex's report-writing module. "I am unable to load it and the program disk at the same time," Malmberg said. "They should be stored on the same diskette."

Despite the beta users' praise of the product, six to eight months after first receiving it the users are like Lone Rangers in their corporations. "Although I am the only person at the company working with the product now, I think it may soon be introduced to other departments," Malmberg predicted.

First commercial deliveries of Reflex began in April.

MEMORY *from page 51*

a variation of memory paging, in which one region of the processor's address space is equipped with an I/O port and performs as a window to the larger paged memory.

In the case of the Lotus/Intel spec, a 64K-byte region called the page frame is mapped out somewhere between 784K bytes and 800K bytes. Within the page frame are four 16K-byte windows — each of which is independently addressable, speeding things up.

Expanded memory paging

The PC-DOS/MS-DOS software driver, called the Expanded Memory Manager, pulls pages of expanded memory into the page frame when they are necessary, according to Intel. The driver also handles programs that run concurrently, as well as print spooling and virtual disk functions.

This, in short, is described by Lotus and Intel as the "expanded memory" approach.

At the spec notes, this approach has nothing to do with what IBM calls "extended memory" for the Personal Computer AT. The AT's 80286 processor potentially can access extended memory in the 1M- to 16M-byte range — but programs running under PC-DOS can't, except as a virtual disk.

Within the MS-DOS world, of course, there are other ways to get that added RAM. Among these is the software segmentation architecture in the Microsoft Corp. Windows environment, which shuffles data around more flexibly, according to Chris Larsen, MS-DOS product manager at Microsoft.

Virtual memory support

Alternatively, the next release of MS-DOS may support virtual memory, a more sophisticated technique than memory paging and one that will bring "personal computer software technology into the 1970s," speculated Richard Strauss, vice-president for products at Corporate Software, Inc.

As usual, IBM's plans remain obscure. Tom Billadeau of TRB & Associates is among those suggesting that Big Blue may go with a virtual machine facility, "which could be cheaper."

While acknowledging that uncertainty, however, Kapor pointed out that "there's nothing else out there now."



extra features. So they're more than an alternative... they're an advantage. With cost efficiency only a high-volume manufacturer can offer.

And every Telex product is backed by over 2,000 Telex-dedicated service and support people worldwide.

What kind of company is Telex? Strong enough to have earned the confidence of a

market that demands stability, dependability and innovation. That's why more and more companies are trusting Telex to be their #1 3270 supplier.

For more information, contact John Hawkins, 6422 E. 41st Street, Tulsa, OK 74135/1-800-331-2623.

The #1
3270 Alternative
TELEX
TELEX COMPUTER PRODUCTS, INC.

Computer Simulation



MICROCOMPUTERS

Lotus unveils report writer for 1-2-3

CAMBRIDGE, Mass. — Lotus Development Corp. last week introduced 1-2-3 Report Writer, a \$150 program well described by its title.

The package will enable users of Lotus' 1-2-3 program to create custom reports and forms using data from 1-2-3 data base files.

The Report Writer is said to change or delete fields, to add multiple line headers or footers, to sort up to four levels and to perform calculations.

Additionally, the product will save report formats and libraries for future use, according to a spokesman. It will store up to 30 different formats per file.

The package will handle up to 150 fields and as many records as a 1-2-3 data base can contain, he said.

Originally developed by Concentric Data Systems, Inc. of Westboro, Mass., and named 3-2-1 Report!, 1-2-3 Report Writer represents the first Lotus product to reach the market that was not developed in-house, the spokesman noted.

The program reportedly will work with existing versions of 1-2-3 and with the release scheduled for fall shipment.

Available this fall, 1-2-3 Report Writer will run on the IBM Personal Computer, Personal Computer XT, Personal Computer AT and the Compaq Computer Corp. line of IBM-compatible systems.

Running with 1-2-3, it requires 256K bytes of internal memory. IBM's PC-DOS or Microsoft Corp.'s MS-DOS 2.0 or higher operating system and a minimum of two floppy disk drives.

The software will be demonstrated for the first time at Comdex/Spring '85 this week in Atlanta, the spokesman said.

Lotus is headquartered at 55 Cambridge Pkwy., Cambridge, Mass. 02142.

AST, Borland to market tool

IRVINE, Calif. — AST Research, Inc. and Borland International have announced a joint marketing agreement under which Borland's Sidekick desktop utility software package will be bundled with AST's Sixpackplus multifunction board for the IBM Personal Computer.

Under the agreement, AST will begin including Sidekick in Sixpackplus this month. A nonprotected copy of Sidekick will be mailed to existing Sixpackplus users, AST said.

Sixpackplus reportedly offers up to 384K bytes of memory and several I/O capabilities.

Sixpackplus with 64K bytes of memory and Sidekick costs \$395. Sold separately, Sidekick costs \$84.95 in its unprotected version.

AST Research is located at 2121 Alton Ave., Irvine, Calif. 92714.

Commodore high-performance micros out

Unix-compatible C900 based on Zilog CPU

HANNOVER, West Germany — Amid much fanfare here at last month's Hannover Fair, Marshall Smith, Commodore Business Machines, Inc. president, launched that company's latest entry into the high-performance range of microcomputing — the Commodore 900. The product is a 16-bit AT&T Unix-compatible personal computer.

The C900 machine, based on Zilog, Inc.'s 28000 CPU, will be available in two versions, Models I and II. Model I operates as a single-user personal

workstation with an emphasis on computer-aided design applications. The Model I features a graphics resolution of 1,024 by 800 pixels, a mouse control device and windowing capabilities. It comes with a 16-in. monochrome monitor, a video controller card with a 128K-byte memory and a 20M-byte hard disk.

The Model II, the multitier system, is equipped with C compiler software, more than 50 applications and a Business Basic compiler. Model II features a monochrome monitor and a 67M-byte hard-disk capacity, and supports up to seven RS-232C ports. The main storage capacity of both models is 512K bytes of random-access memory, expandable to 2M

bytes. The built-in hard disk has between 20M and 67M bytes, and the floppy disk drive has 1.2M bytes.

The C900 runs under the Cohesent operating system offered by Mark Williams Co. of Chicago. Cohesent is said to be completely compatible with AT&T's Unix System V Version 6.2 and to put its utilities and operating system into 2M bytes of disk space.

The Commodore 900 machines will be built in Germany and will be available in the U.S. in the third quarter. Prices for the machines will begin at approximately \$2,700, Smith said.

Commodore is headquartered at 1200 Wilson Drive, Westchester, Pa. 19380.



We dropped the price of our modems.

The cost of transmitting data just keeps getting lower and lower. Thanks to Datagram. And our line of inexpensive, yet immensely talented modems.

All are totally soft and down-line loadable, have built-in signal quality monitoring, and run on unconditioned voice grade lines. Yes, that's right. Even our 14400 with built-in six channel buffered mux which sells for under \$5,000. Unbelievable? No, just Datagram know-how.

Our 9600 point to point modem is a real work horse at only \$1495. But if you want a 9600 with a four channel buffered mux, we've got that too at only \$1895.

At \$1395, you can't beat our 4800's. In a multi-drop application they'll train in 50 ms. More importantly, you can test all modems from the central site.

On top of that, all our modems are preconfigured at the factory, so all you have to do to get them going is connect them to the line.

We can have modems in your hands in just 72 hours. So call now, 1-800-235-5030 and order your Datagram modems today.

Datagram

We make networks work harder.

USA: Chicago, IL 1100 Street, East Greenwich, Rhode Island 02880
Canada: International Datagram Inc., 1401 Oakview Blvd., Scarborough, Ontario, Canada M1B 5A1
Branch offices in major cities.

SPECIAL REPORT

Manufacturing Systems

Manufacturers who want to automate their operations have a number of technologies to choose from. In the May 27th Computerworld Special Report we'll explore all aspects of computer integrated manufacturing (CIM):

- computer-aided design & manufacturing (CAD/CAM)
- microcomputer-based material requirements planning (MRP)
- communications networks (including LANs)
- inventory control
- shop floor control

We'll also discuss how these components tie together, and how they affect MIS/DP operations in a manufacturing environment.

So if you sell manufacturing systems or related products, tell Computerworld's more than 600,000 readers in the May 27th issue. Simply fill out the coupon below and return it today to reserve space for your ad. Or, if you prefer, call Ed Marecki (National Sales Director) at 617-879-0700.

Advertising closes May 10

- ☐ Yes, I want to reach active buyers of manufacturing systems and related products. Please send me advertising information on the May 27th Special Report issue.
- ☐ I'd like information about the upcoming Special Report issues of Computerworld. Please send me Rate Card No. 20.
- ☐ Please have a sales representative call me.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Phone _____

Return to:
Ed Marecki, National Sales Director, Computerworld,
375 Cochituate Road, Framingham, MA 01701

COMPUTERWORLD



COMPUTERWORLD

MICROCOMPUTERS

Quadram announces voice/data integration boards for IBM micros

NORCROSS, Ga. — Quadram Corp. has introduced for the IBM Personal Computer and Personal Computer XT its Silver Quadboard enhancement card and its Asher C1200 and C2400 voice/data integration boards.

The Silver Quadboard is said to offer up to 640K bytes of memory based on 256K-bit dynamic random-access memory (RAM) chips. It comes bundled with Quadmaster III software and includes one parallel and one serial port.

The Quadmaster III software reportedly offers users the ability to set up virtual memory disks in RAM, with the virtual disk size fixed in 1K-byte increments. The package also includes a controlled print buffer.

The C1200 and C2400 Asher boards reportedly are full-length cards linked through dual cables to the user's telephone system. Communications commands are controlled by the Personal Computer's keyboard, and voice and data transmission takes place simultaneously.

The C1200 reportedly offers communication at 1.2K bit/sec. and can be upgraded to 2.4K bit/sec. without replacing the entire card. Both cards are equipped with a concurrent win-

dowing program that permits users to run five different programs in main memory.

The C1200 costs \$895; the C2400 is \$995.

Without memory, the Silver Quadboard is offered with serial, parallel and game ports, clock/calendar and software for \$325. Memory configurations are priced as follows: 64K bytes, \$395; 384K bytes, \$595; and 640K bytes, \$795. An optional second serial port costs \$60. The Silver Quadboard reportedly will be available in the second quarter.

Quadram is located at 4366 International Blvd., Norcross, Ga. 30093.

Service program offered

CULVER CITY, Calif. — Ashton-Tate has announced a Corporate Emphasis program, designed to supply large corporations with technical support and programming tips. Companies purchasing 25 copies of Ashton-Tate products are eligible for the program.

Services include a technical support phone line open only to large corporations, a list of third-party training companies certified by Ashton-Tate and the help of Ashton-Tate engineers in developing various applications.

The program provides self-study training textbooks, workbooks and demonstration diskettes.

Ashton-Tate also announced it

will begin publishing three periodicals. "Tech Notes," designed for corporate microcomputer support specialists, will offer tips on applications development, the vendor said. "Corporate Update Newsletter" will supply executives with product information. "Ashton-Tate Quarterly Review" will consist of case studies and other materials from books published by Ashton-Tate's Publishing Group.

In addition, Ashton-Tate plans to form an advisory board of corporate microcomputer managers to inform the company of other support needs.

Ashton-Tate is located at 10150 W. Jefferson Blvd., Culver City, Calif. 90230.

Realia COBOL. Migration without migraines.

Until recently, you had to abandon the business computer language when you developed microcomputer application software. The available micro COBOLs were inadequate—too limited, too slow. The best alternative—the XT/370 or AT/370 using IBM's COBOL—was very expensive and still too slow. To get acceptable performance, you had to retrain your programmers in Pascal or C.

Realia COBOL is the cure for such headaches.

Realia's compiler supports most IBM VS/COBOL and VS/COBOL II features, such as:

- COMP and COMP-3 data
- GOBACK, EJECT, and SKIP statements
- SELECT assignment names
- Structured programming extensions of VS/COBOL II
- Multiple entry points

You can download mainframe systems for development, maintenance, and testing. Productivity will soar.

You can compile faster with Realia COBOL than in most mainframe environments, even on floppy-based systems. Compile-time options allow cross-reference, brief and full code listings, and helpful features like subscript and decimal value checks.

Our interactive debugger lets you follow the program source, display and modify data, and set breakpoints using the normal optimized machine code.

The results are startling.

Our users report that their systems run up to 20 times faster when compiled by Realia COBOL. That's compared to our nearest micro competitor. The ratio is up to 100 times faster when compared to any of the others.

On the IBM PC, AT, your programs can run at 370/148 to 370/158 speed. Realia's file system really makes your machine deliver, giving it a distinct edge over Pascal or C. Our indexed file system even has full key compression and buffer controls just like VSAM. The generated code is pure MS-DOS, so it can be run on most of the 8086/8088 machine family.

And you can sell your programs without paying us a royalty fee.

Realia COBOL is priced at \$995, including one year of maintenance and upgrades. Subsequent maintenance and upgrade contracts are currently priced at \$125/year/copy. Available for the IBM PC, PC XT, 3270 PC, PC AT, PC-compatibles, and the TANDY 2000.

Realia COBOL. What a relief.

IBM, IBM PC, PC XT, 3270 PC, PC AT, TANDY 2000 are registered trademarks of International Business Machines Corporation. MS-DOS is a registered trademark of Microsoft Corporation.

**Professional Software
for the Personal Computer**

**REALIA
INC.**

10 South Riverside Plaza
Chicago, Illinois 60606
(312) 346-0642

Datacopy adds enhancements to Wips system

MOUNTAIN VIEW, Calif. — Datacopy Corp. has introduced two software packages that enhance its Word Image Processing System (Wips) and one package that provides Wips capabilities without the use of an image scanning device.

The Wips system operates on the IBM Personal Computer XT and AT and consists of a scanning device, which captures an image, and Wips software, which reportedly permits image storage and manipulation.

One of the packages, Wips Editor, permits the editing of a Wips image file at the picture element level, according to the vendor. It allows scrolling in its zoom mode and features such editing tools as paintbrush, airbrush, erase, drawing and text insertion. Cut-and-paste capability is also provided.

Another of the packages, Wips Planner, reportedly permits page planning, including the layout of pages and integration of text and graphics. The layouts are created by defining boxes for text and images or by modifying standard layouts.

The third product, Wips Jr., is said to contain all of the image-handling capabilities of the standard Wips software except image capture capability. Systems under Wips Jr. gain images for manipulation via diskettes or a communications network.

Wips Jr. is priced at \$495. Wips Planner costs either \$995 or \$1,350 depending on features. Wips Editor is priced at \$245.

Datacopy is located at 1215 Terra Bella Ave., Mountain View, Calif. 94043.

**If you use DBMS,
you've seen d way.
And you've seen R way.**

**Now take a look
at something
completely different.**

Your way.

Introducing R:base
Because your people
be using applications than

If you're like most M.I.S. directors, you're under pressure to be more productive than ever before.

And now, there's a new DBMS product that can take this heat off your department.

It's the all-new R:base™ 5000.

It doesn't matter if it's being used by your top programmer, a rookie sales manager, or anybody else in the company. With new R:base 5000, anyone can develop custom, heavyweight applications—and save hours, even days of development time.

5000. would rather waiting for them.

The secret of new
R:base 5000?

A unique
menu-driven

Application Express™ feature that actually generates programming code. While guiding your users through the entire development process. So, instead of entering thousands of keystrokes, or writing lines of code, they just answer a series of simple questions. Then, the Application Express does the rest. To speed things up even more, it includes instant forms and reports, too.

New R:base 5000 also features a fast new way for your staff to set up their databases: visually. They simply fill in the blanks in an on-screen table. And if they want to build menus into an application, they just tell the Application Express what to do, and it writes the code automatically.

For the novice users in your company, new R:base 5000 is a way to write complex applications right off the bat. And it gives veteran programmers the heavyweight procedural language they need to build sophisticated applications and systems—with or without the Application Express. Either way, they'll save time and increase their productivity. Because R:base 5000 also gives them fast and easy data verification, data entry, and report generation.

So why not give the whole company a big boost? And give yourself a break at the same time?

Check out the all-new R:base 5000.

And see what it's like to have everything running your way.

**PRODUCTIVITY:
R:base 5000 vs. dBASE III
CLIENT DATABASE MENU**



Using dBASE III™ and R:base 5000, we built this menu and linked it to its sub-routines. The resulting applications were equivalent. The effort required wasn't.

	R:base 5000	dBASE III
Automated steps	37 *	0
Command lines	47	244
Keystrokes	434	8598
Time*	9 minutes	2 hours

*Actual time may vary depending upon skill level.

R:BASE 5000

FROM MICRORIM

Your way. That's R way.™

Introducing R:base
Because it takes a real
to go the distance

Most people think dBASE III* is the heaviest, most powerful DBMS you can get your hands on.

But wait till you see the new R:base® 5000.

It's got more of the heavyweight programming power it takes to develop powerful DBMS applications. Starting with a comprehensive procedural language that's faster and easier to use. With functions dBASE III doesn't even offer. Like a data dictionary. User-definable rules. And password security.

5000. heavyweight with you.

What's more, new R:base 5000 also features more structural modification capability than ever. With commands

that can expand, change, and remove columns and tables in a database. Instantly.

With dBASE III, the report generator is extremely rigid. But new R:base 5000 makes things a lot more flexible. With up to 9 different levels of subtotals. Access to system date and time. And multi-table report generation.

And the heavyweight story doesn't end there. New R:base 5000 even comes with a set of pre-defined macros, for faster, cleaner application development. These macros can also be customized to fit any application.

So if you need a DBMS that can take on the heaviest jobs of all, you need the all-new R:base 5000.

It's never been easier to go the distance.

HEAVYWEIGHT FEATURES		
	R:BASE 5000	dBASE III
Comprehensive Procedural Language:	Yes	Yes
Application Compiler:	Yes	No
Report Writing Features: (A) Access to System Date and Time:	Yes	No
(B) Choice of Column or Row Format:	Yes	No
(C) Accessible Tables:	40	10
Password Security:	Yes	No
User-Definable Data Entry Rules:	Yes	No
Automatic Key Index Maintenance:	Yes	No
Data Dictionary:	Yes	No
Number of Relational Operators:	6	2

*From original manufacturer.

R:BASE 5000
FROM MICRORIM
Your way. That's R way.™



See what it's like to have things your way. 1-800-547-4000.

If you'd like to get a look at the new R:base™ 5000, just give us a call at the above number (ask for Dept. 968). From Oregon, or outside the U.S., call 1-503-684-3000, Dept. 968. For only \$9.95 (plus shipping), we'll send you an interactive tutorial. Not a canned demo, but a "mini-version" of the product that actually lets you build applications.

Give us a call and we'll send your tutorial right out. But if you want to see R:base 5000 today, head for a leading computer store or software dealer.

And discover the DBMS that lets you deal with information the way you're accustomed to.

Your way.

R:BASE 5000
FROM MICRORIM
Your way. That's R way.™

COMMUNICATIONS

WIRE TAPDANEL MINOLI

Net optimization takes practical insight

Some network design issues from five years ago still confront the practitioner trying to optimize a network in the postvideotext era to take advantage of tariff gradients for traffic flowing within and between Local Access Transport Areas.

These issues relate to the processes used to calculate the resources needed to connect corporate facilities, which determines such things as the number of lines, ports or pooled modems needed. The de-

sire of network optimization is to minimize the facilities used while achieving a desired grade of service based on response times and the number of busy signals the user is willing to endure.

The pragmatist who routinely consults modeling tables to determine the number of lines needed to support given traffic patterns — such as Erlang B tables — may be overlooking some assumptions made with the model that could obscure actual needs.

The following are some assumptions intrinsic to many modeling aids that diverge from the conditions typical of network environments:

■ Many optimization models assume — for mathematical reasons — that the

number of users that need to be supported at a remote site is infinite. Presuming that all other assumptions made with network models such as Erlang B are valid, this assumption leads to drastically different results compared to the answers reached when the real population at that site is considered.

A more sophisticated model, the Engset model, uses not all of the same assumptions as Erlang B but takes into account real user populations, leading to a more realistic determination of the resources needed. Formulas that use infinite populations can suggest the use of twice as many lines or ports, for example, as models that take into account actual user

See NEWS, page 73

Minoli is an associate vice-president, systems planning and engineering, of Prudential-Bache Securities, Inc. in New York.

IBM 3274 upgrade coming?



DATA STREAM
John Dix
City Senior Editor

Although the timing is still uncertain, there are many indications that IBM is resending a replacement for its workhorse communications controller, the 3274, that will offer a slew of improvements over the older box.

While some of the capabilities discussed here are drawn from user wish lists instead of from concrete insight into what the controller will actually look like, most assumptions revolve around the idea of increasing connectivity on both the workstation and host sides of the controller.

Many of the capabilities analysts

expect to be incorporated into IBM's 3274 replacement are already available from plug-compatible controller manufacturers. The replacement box will, for example, probably support 64 devices, twice the number supported by the 3274; this is a feature available from a couple of competitors.

Today, the 3274 within IBM's System Network Architecture (SNA) is a Type 2 Physical Unit (PU). All nodes in SNA networks are categorized as one or more of the following: an actual physical unit type, a Logical Unit (LU) or a Systems Services Control Point (SSCP).

Within SNA the 3274 replacement will likely be an upgraded type of Physical Unit known as a PU 2.1. If

See 3274 page 72



HP announces local network connecting superminis, micros

PALO ALTO, Calif. — Hewlett-Packard Co. has announced HP 9000 LAN, a local-area network that connects HP's 9000 Series 500 supermicrocomputers and HP 9000 superminicomputers. HP 9000 LAN is based on HP's Advanced local network. HP 9000 LAN reportedly supplies an Ethernet-type interface, supports transmission speeds up to 10M bit/sec., runs on baseband media and includes multiple access collision detection facilities. The local network is said to connect up to 100 devices over a maximum distance of 500 meters.

HP 9000 LAN features file transfer capability, remote program management, interprocessor communications and remote file access.

The product consists of interface cards for each node and network software. The card costs \$2,200.

For single-user HP 9000 devices, the software costs \$1,700 for the first node, \$850 for additional nodes. For multiuser devices, software is \$4,000 for the first node, \$2000 for each extra node.

HP is located at 3000 Hanover St., Palo Alto, Calif. 94304.

Seminar views communications issues

By Paul Karanowski
City Editor

BOSTON — Corporations are being forced to monitor a meteoric rise in the use of communications with inadequate network management tools.

That message was delivered at "Strategic Planning for Network Management," a seminar that took place during Network Management Technical Control, a conference held here recently sponsored by the CW/Conference Management Group based in Framingham, Mass.

Wayne Hall, manager of corporate network programs at Digital Equipment Corp., monitors DEC's in-house network, which connects more than 40,000 terminals, 5,000 personal computers and 2,700 nodes throughout the world. "Our network is probably 100 times larger than any of our customers' networks," he said. "Since the network is so large, it presents us with some challenges. There are no network management packages designed for such a large system, and we can't turn to other companies to help solve the problem."

Hall's problem will become worse during the next few years as the network expands and the number of personal computer users grows to 25,000 or 30,000.

As this process evolves, network growth may be

limited by network management system inadequacies. James G. Herman, director of network architecture at IBM Communications Corp. in Cambridge, Mass., noted, "As networks grow and become more complex, one may not possess the tools needed to monitor and fix them. It is similar to the use of vacuum tubes. As vacuum tubes became the limiting factor to what a computer could do, new technologies had to be developed."

Hall concurred. "Just tracking and managing equipment used on our network has become a difficult task," he noted.

Another missing item in network management systems is a telephone cost tracking system. "Telephone costs differ throughout the world," he said. "Just determining what our telephone costs are can be a tedious process. Once these costs are determined, one must determine where costs can be cut. If we cut costs, we must substantiate those cuts. Whenever we want to spend money for new equipment, we have to show where the money is going."

Another problem is monitoring network performance. "It is difficult to separate network functions from the software that runs on the network," he said. "Do response time improvements stem

See NEWS, page 72

■ Cohesive Networks has released T1 products for backbone networks/68

■ Memotec Data has introduced a network management system that runs on an IBM Personal Computer XT and can be used to monitor an X.25 network/68

■ Hewlett-Packard has announced a statistical multiplexer that connects up to 16 workstations/68

■ Bridge Communications has announced an Ethernet gateway that can be used to tie network segments together into a net up to 40 kilometers long/70

INSIDE

Multiplexers/
Modems/69

Local-Area
Networks/70

Network Services/71

Test Equipment/71

Auxiliary
Equipment/71

COMMUNICATIONS

System enables users to create nets with T1 facilities

CAMPBELL, Calif. — Cohesive Networks, Inc. has released the Cohesive System, products said to enable a company to create backbone networks using T1 1.544 Mbit/sec. digital communications facilities.

The product consists of two parts: CN-1 nodes and the operation management system (OMS).

A CN-1 node is compatible with the widespread digital services offered by AT&T, the former Bell operating companies and interchange carriers, as well as private T1 transmission equipment such as microwave, fiber-optic, satellite or coaxial media, the vendor said. T1 lines and

digital transmission equipment can be connected to CN-1s through standard DS-1 interfaces.

The product supports asynchronous transmission rates from 50 to 19.2K bit/sec. Synchronous transmission through 56-528 interfaces ranges from 1,200 to 19.2K bit/sec.

Synchronous transmission

rates for V.35 connections range from 1,200 to 56K bit/sec. Up to 56 RS-232 ports operating at speeds up to 9.6K bit/sec., or up to 28 V.35 connections operating at 56K bit/sec., can be attached to the network.

A CN-1 node controls different transmission facilities and devices through a timing and control scheme called au-

tomotive adaptive network synchronization. Each node can reroute transmissions if a link fails.

A single OMS, consisting of a computer with 80M bytes of hard-disk storage, terminal and printer, is needed for each network. OMS enables a user to configure a network and dedicate types of lines between different

nodes. It also supplies diagnostic features and provides summary reports of network usage, according to the vendor.

Cohesive System costs range from \$50,000 to \$70,000 per node.

More information is available from Cohesive Networks, located at 1680 Dull Ave., Campbell, Calif. 95008.

Net manager debuts, runs on IBM micro

NORCROSS, Ga. — Memotek Data, Inc. has introduced Network Control Centre (NCC), a network management system that runs on an IBM Personal Computer XT and can be used to monitor an X.25 network.

The product monitors X.25 packet transfer/bytes, senders and X.25 switch concentrators and stores call information on the micro-computer's hard disk, the vendor said. Reports on network status, use and call billing can then be generated. For example, the package will provide reports listing who used the network, how long the user was connected to it and how many packets of data the user sent on the network. The software also supplies billing information on network users.

A vendor spokesman said the package monitors the condition of each device on the network and informs a central operator whenever there is a problem.

NCC runs on a Personal Computer XT with IBM's PC-DOS 2.1 and 256K bytes of random-access memory.

NCC costs \$5,000.

Memotek Data is located at Suite 106, 3320 Holcomb Bridge Road, Norcross, Ga. 30092.



Now, whether you're a VAR, OEM, systems integrator or software house, you can dive into the IBM large account base and take advantage of emerging departmental computing opportunities.

With the Canaan 5400 Departmental Computer, you can expand your product offerings directly to departments and end-users in large IBM VM/CMS environments. And offer a truly distributed Information Center solution that includes:

- Full VM/CMS File Compatibility
- IBM Host and PC Communications
- Multi-user Support
- Multi-window Processing
- IBM PC Support
- Standard Workstations (3278, ASCII, Graphics)
- Industry Standard Multibus*

All in an office environment system!

We've got a line on VM/CMS.

It's IBM's fastest-growing 370 operating system. And Canaan's VM/CMS-compatible system runs the millions of dollars of available applications, compilers and communications software without program conversion or modification.

Canaan supports an aggressive Software Certification Program to test, certify and appropriately price third party software products. Our extensive library of software already certified on the Canaan Departmental Computer includes many of the most popular data base management, decision support, electronic spreadsheet, graphics, statistical analysis, document composition and text retrieval packages. And new software products are being certified daily.

You can further penetrate IBM accounts by offering your applications to a wider range of departmental users in areas like marketing, finance, engineering and human resources, to name just a few. At the same time, you will be helping them leverage their investment in IBM products and providing Information Centers with an outstanding product to help meet end-user needs.



CANAAN

We're VM/CMS driven.

Plunge into low-cost departmental computing solutions.

Canaan's VM/CMS-compatible Departmental Computer has an entry price of less than half of IBM's lowest-priced multi-user VM system. Opportunities, therefore, abound for VARs and OEMs to increase their bottom line profits by integrating the Canaan 5400 into their product lines as a vehicle to deliver departmental-based applications.

The Canaan 5400 supports a cluster of eight IBM Personal Computers or other workstation devices. Our PC file transfer product provides greater disk storage and backup facilities for PCs. So now, PC users can access local CMS-based applications running on the departmental computer and maintain full file compatibility with an IBM mainframe.

Productivity aids previously restricted to IBM mainframes, such as FOCUS, RAMIS II, MODEL, STRATAGEM, and DYNALAN, run on the Canaan 5400 at a fraction of their mainframe cost. And the Canaan 5400 can also serve as a communications gateway to IBM mainframes to retrieve and update corporate data bases.

The industry standard Multibus design allows you to integrate a variety of engineering/graphics displays and peripherals. This makes the Canaan 5400 an ideal system for sophisticated graphics applications such as VLSI design and CAD/CAM.

Departmental computing...a treasure chest of opportunities.

Now, with Canaan's growing library of certified software, you can really expand your market opportunities by offering new solutions to IBM's installed base of over 1.5 million CMS users. And by offering departmental computing solutions to more than 10 million personal computer users.

To find out more, call us on Canaan's hot-line: 1-800-382-4100. (In CT call: 203-372-8100) Or just drop a line to: Canaan Computer Corporation, 39 Linden Drive, Trumbull, CT 06611. We'll send you a complete brochure on the Canaan 5400 Departmental Computer.

COMMUNICATIONS

Xpert gets Uninet OK

ALEXANDRIA, Va. — Atlantic Research Corp. has announced that its Xpert terminal has been certified for use on Uninet, Inc.'s public packet-switching network.

Xpert reportedly can hold four host sessions simultaneously and emulates IBM 3270 series, Digital Equipment Corp. VT100 and Ascii terminals. Users can move

from one host session to another by pressing a few keys.

Because the product was designed for packet-switching networks, the terminal does not require a packet assembler/disassembler or protocol converter, the vendor said.

Atlantic Research is located at 6390 Cherokee Ave., Alexandria, Va. 22312.

MULTIPLEXERS/
MODEMS

■ Holtek-Klein Corp. has announced 14400/M, a 14.4K bit/sec. modem that is said to operate over AT&T leased lines.

The modem features synchronous operation, a variety of tail circuit applications, automatic adaptive equalization, fault isolation, performance capability, remote control diagnostics,

noninterfering port diagnostics, independent monitoring of RS-232 signals on each port, dynamic real-time digital line quality monitor and bit-error rate tester.

A vendor spokesman said the product is available in single-port or multipoint configurations. A single-port model has 12K and 9.6K bit/sec. fallback transmission rates. A multipoint configuration allows up to four channels to send data over the same path, the vendor said.

A single-port version of the product costs \$3,295. Holtek-Klein, 6950 Bryn Dairy Road, Largo, Fla. 33543.

■ Astrocom Corp. has introduced a modem emulator that operates either separately or combined with RS-232 and V.35 interfaces.

The modem emulator replaces two back-to-back modems and can provide RS-232-to-V.35 interface conversion. The V.35 interface allows synchronous devices to communicate at distances of up to 2,000 ft. The emulator runs asynchronously at speeds up to 57.6K bit/sec. or synchronously at switch-selectable speeds of 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K or 57.7K bit/sec.

Single-quantity prices are \$367 for the RS-232 stand-alone version and \$225 for the circuit card version. The optional V.35 interface unit is \$410 for the stand-alone version, \$206 for the circuit card version.

Astrocom, 120 W. Plato Blvd., St. Paul, Minn. 55107.

■ Holtek-Klein Corp. has announced the 9600/TF, a 9.6K bit/sec. diagnostic modem that can monitor up to 15 remote devices on a multipoint line.

The 9600/TF reportedly enables users to perform remote polling tests and a universal test that simulates polling performance of a multipoint network. It is said to feature a built-in network diagnostic system, automatic retrain on remote modems, automatic autistreaming, fault isolation and performance monitoring. The modem supports asynchronous half-duplex or full-duplex communications.

The modem's retraining cycle during each poll of a multipoint line takes 30 msec, the company reported.

The 9600/TF costs \$2,675. Holtek-Klein, 6950 Bryn Dairy Road, Largo, Fla. 33543.

■ Hewlett-Packard Co. has announced HP 2324A, a rotational multiplexer that connects up to 16 workstations.

The product is said to work with analog or digital leased lines, dial-up lines or

Continued on page 70

COMMUNICATIONS

FOR THE IBM 530

For more information
Contact Charles White at
enclawhite, room 5, suite, Rd.
P.O. Box 4530
Oak Brook, IL 60451
phone 312-593-9193

COMMUNICATIONS

Continued from page 68

X.25 packet-switching networks. The HP 2334A transmits data at speeds up to 19.2K bit/sec. and supports port speeds to 9.6K bit/sec.

The full-duplex, asynchronous product may be integrated into an X.25 network, the company reported. For example, HP 2334A can be connected to an HP 3000 series or HP 1000 series minicomputer and act as a remote X.25 workstation cluster controller, according to the vendor.

HP 2334A prices range from \$2,600 for a 16-port version to \$8,000 for a 64-port model.

HP, 1230 Embarcadero Drive, Palo Alto, Calif. 94303.

■ Tel Communications, Inc. has introduced a combination data service unit and channel service unit for use with AT&T's Dataphone Digital Service network.

The product, Duxline, includes three loopbacks and a self-test feature. An eight-position modular jack makes it possible to interface with other networks, the vendor said.

The 8500-000 version transmits data at 2,400, 4.8K and 9.6K bit/sec. It is priced at \$795. The 8500-001 model transmits data at 2,400, 4.8K, 9.6K and 56K bit/sec. and lists for \$895.

Tel Communications, 17600 E. Exposition Drive, Aurora, Colo. 80017.

■ CTS Fohet-Tek, Inc. has introduced three modems, CTS 4827, CTS 9629 and CTS 14.4MX, to its product line.

The modems feature adaptive equalization, front-panel programmability and LCD status, the vendor said. The products are designed for four-wire leased lines and operate in either half-duplex or full-duplex mode.

CTS 4827 transmits data at 2,400 bit/sec. or 4.8K bit/sec. and features phase shift frequency modulation. CTS 9629 works at speeds of 4.8K bit/sec., 7.2K bit/sec. or 9.6K bit/sec., and the CTS 14.4MX transmits data at 4.8K bit/sec., 7.6K bit/sec., 9.6K bit/sec. or 14.4 bit/sec. Both CTS 9629 and CTS 14.4 work with quadrature frequency modulation.

CTS 4827 costs \$1,395, CTS 9629 sells for \$1,745, and the CTS 14.4MX is priced at \$4,595, which includes a six-channel multiplexer.

CTS Fohet-Tek, 6900 Shady Oak Road, Eden Prairie, Minn. 55344.

LOCAL-AREA NETWORKS

■ Data General Corp. has introduced a software I/O driver that allows most DG Eclipse/MV superminicomputers to access Network Systems Corp.'s Hyperchannel local-area network.

The software driver runs under DG's AOS/VS operating system and enables the DG processors to be interconnected in a multivendor environment using the coaxial cable-based Hyperchannel network. Systems that can be supported include equipment from IBM, Digital Equipment Corp., Control Data Corp., Honeywell, Inc. and others, the spokesman said.

The AOS/VS Hyperchannel Driver is priced at \$8,840.

DG, 4400 Computer Drive, Westboro, Mass. 01580.

■ Digital Microsystems, Inc. (DMS) has announced Univac Hinet Gateway, which is said to provide synchronous communications between DMS Hinet local-area networks and Sperry Corp. 1100 mainframes.

DMS' Hinet is a baseband network that supports up to 63 users and has a transmission speed of 500K bit/sec. With the product, terminals or personal computers supported on a Hinet network emulate Sperry Univac 20 terminals. The device is also said to support file transfers between the network and the mainframe.

Univac Hinet Gateway costs \$4,995.

DMS, 1755 Embarcadero, Oakland, Calif. 94606.

■ Massachusetts Computer Corp. (Masscomp) has announced an en-

hanced version of its Multibus interface for the Ethernet network. It is designed for Masscomp 860 series 32-bit computer systems.

The interface is said to offer throughput performance in excess of 90K byte/sec. Transmission control protocol is reportedly implemented on the board, off-loading the CPU of all packing, unpacking and retransmission of user data, Masscomp said. The interface reduces CPU cycle requirements for typical Ethernet applications to 0.5%, according to the vendor.

The interface is based on an Excalibur, Inc. Exos-201 module and the most recent versions of Ethernet software and the Masscomp RTU operating system.

The product is priced at \$3,900, the vendor said.

Customers using the previous Eth-

ernet interface may upgrade for \$2,500.

Masscomp, 1 Technology Park, Westford, Mass. 01886.

■ Bridge Communications, Inc. has announced Gateway Server/4 (GS/4), an Ethernet-to-Ethernet gateway that can be used to tie local network segments together into a net up to 40 km long.

Placed between Ethernet local-area networks, the product can connect networks using coaxial or fiber-optic media and overcome the 2.5-km limitation of most Ethernet networks, the vendor said.

The product overcomes the limitation with a packet/repeat function that automatically restarts the carrier-sense multiple access with collision detection algorithm on each net-

HOW TO SURVIVE TOO MUCH OF A GOOD THING.

If you're having trouble getting your bearings in the new long distance environment—relax. There's a way out.

ROLM to the rescue.

ROLM has new technology you can grow with, phone bills you can live with.

Only ROLM has perfected a gee whiz feature called Integrated Call Management, blended it into the ROLM®CRX II business communication system.

It can shop dozens of competing long distance services.

It can zero in on the cheapest long distance route automatically. Instantly. So you can take advantage of volume discounts or time-of-day savings on every single call.

You're not limited to just one carrier. There are no equal access penalty charges or delays for changing services. And because CRX II watches every call—like the millions of per-

work. GS/4 filters network traffic between local-area networks and automatically balances traffic loads and reduces delays, Bridge Communications said.

The product's network management facilities provide information on collisions, cycle redundancy checks, alignment errors and byte and packet throughput.

GS/4 uses three Motorola, Inc. 68000 microprocessors, two for the controller and one for network protocol. The product provides inter-network throughput of 360 packets or 1.75M bit/sec., according to the vendor.

The product costs \$9,900 plus a \$160 annual software license fee, the vendor said.

Bridge Communications, 1345 Shorebird Way, Mountain View, Calif. 94043.

NETWORK SERVICES

■ Memotec Data, Inc. has announced SP-836, a packet assembler/disassembler (PAD) designed for X.25 networks.

The product reportedly provides statistical multiplexing features that enable up to four asynchronous ports to be supported over a single link. Each port can transmit data at speeds from 75 bit/sec. to 9.6K bit/sec. with the X.25 data link supporting transmission speeds from 1,200 bit/sec. to 9.6K bit/sec.

The product conforms to CCITT X.25, X.3, X.28 and X.29 standards, the vendor said. SP-836 features auto-poll, auto-priority, auto-connect, port burst groups and support for Digital Equipment Corp. VT100 terminals.

The PAD weighs 5 lb and includes an external power supply.

SP-836 costs \$1,715.
Memotec Data, 600 McCaffrey St., Montreal, Quebec H4T 1N1.

TEST EQUIPMENT

■ Tektronic, Inc. has added two devices, the 836 and 836L, to its line of portable data communications analyzers.

Both devices are said to provide line monitoring, interactive exercising and simulation and data link testing for bi-synchronous, asynchronous, X.25, Synchronous Data Link Control and high-level data link control networks, the vendor reported.

The 836 operates full duplex at data transfer rates of up to 72K bit/sec.

The 836L operates at 144K bit/sec. The 836 features a data transfer capability that allows buffer contents and read-only memory data to be exchanged between an 836 and a host system, the vendor said. A user can store setup features, captured data and programs in the product's non-volatile memory.

The 836 operates at speeds of up to 10.2K bit/sec. and is upgradeable to the 836L.

The 836 costs \$4,650, and the 836L sells for \$3,350; both products are available in rack-mounted versions.

Tektronic, P.O. Box 500, Bensenville, Ill. 60007.

■ Dynatech Data Systems has announced Prism, a real-time network performance and management system.

Prism is said to measure performance on from 16 to 2,048 lines, each operating at speeds up to 64K bit/sec. The lines can support a number of protocols including bi-synchronous and Synchronous Data Link Control.

Status reports can be read at a terminal or sent to a printer or plotter. Reports using real-time or historical data can be used to monitor or change a user's configuration. Other reports, including weekly performance summaries, can be generated automatically by the system or by the user.

Prism consists of a Convergent Technologies, Inc. N-Gen or Mega-frame workstation, a Hewlett-Packard Co. plotter and Dynatech software.

Dynatech said that the system costs between \$2,000 and \$5,000 per port. The product will be available in the fourth quarter of this year.

Dynatech, 7644 Dynatech Court, Springfield, Va. 22153.

AUXILIARY EQUIPMENT

■ NNI Corp. has announced PRX Performance Monitor, a software package that runs on an IBM Personal Computer—that is said to translate error codes generated by private branch exchanges into plain English statements.

A personal computer with the software can be attached to the maintenance port of Rolm Corp., Northern Telecom, Inc. or AT&T PBXs. Error messages are written to the computer which, through the program, translates the codes into English so that a maintenance technician does not have to look up each code.

If a serious problem occurs, the product flashes an alarm condition and sounds an alarm through the micro's speaker. In addition, the product supplies daily, weekly, monthly and yearly summaries.

PRX Performance Monitor costs \$1,500.

NNI, Box 1, 1919 S. Shiloh, Garland, Texas 75042.



sonal calls that can squash the company kitty—you can keep track of bills and chargebacks. Call us.

We'll break down your current phone bills. We'll recommend the stingiest carriers. (After all, we built our name managing call costs.) We'll dazzle you with the power of CBX II, the wizardry of advanced routing, the thrill of nationwide service and support.

Not surprising.

We're the folks who taught phones and computers and people to work together on one system. Today, next year and into the next century.

Let's talk. Remember, you're not out of the woods, yet.

ROLM
an IBM company



COMMUNICATIONS

3274 from page 67

coupled with an upgraded logical unit type, LU 6.2, the controller would have inter-system communications capabilities. This would enable the controller to establish sessions between attached workstations, including IBM Personal Computers, and make it possible to support sessions between local devices and workstations supported by remote PU 2.1 controllers without having to route the traffic to a higher level host.

Personal Computers will, in fact, probably have a great deal to do with the capabilities of the 3274 replacement. The asynchronous Ascl devices do not exist neatly in the realm of 3270-type synchronous electric devices. That fact gave birth to a whole submarket for boards that enable Per-

sonal Computers to emulate 3270 workstations.

Instead of emulating 3270 workstations at each Personal Computer, IBM may put a shared 3270 emulator in the upgraded controller. Besides the cost advantage of a shared device, such a capability may enable the Personal Computers to be supported with twisted-pair wire instead of coaxial cable.

To minimize the number of micros needed, a 3270 replacement may also support

a shared Personal Computer. This would enable, for example, 3278 workstation users occasional access to a micro.

Other capabilities that IBM may incorporate into a 3274 replacement include alternate types of host and workstation connections.

The upgraded box will likely be built using the IBM Cabling System — a building wiring scheme — and future IBM local network products in mind. Today's 3274 can be used with the balanced

twisted-pair wire used in the Cabling System, but small adapters are needed to interface the controller's coaxial cable connectors to the telephone-like wire. Certain models of the controller may be available that can directly accept the balanced twisted pair.

IBM may also make it possible to string together multiple workstations with a single cable, possibly with a loop facility or a cable-through capability similar to

that used on its System/34, 36 and 38 processors.

On the link side of the controller, analysts expect IBM to provide multiple-host connections, enabling supported devices to access applications simultaneously on different processors without going through a remote front-end processor.

Finally, for its controllers used locally, IBM may offer a fiber-optic interface to replace IBM channel bus and tag cables.

LIMITS from page 67

from changes in applications software or network enhancements?

Network management could be an important management tool, but today's packages do not provide reports needed to evaluate a network. "We would like to monitor end-to-end transmission of messages," Hall stated. "That capability would give us a good look at how the corporation is operating. Today, only node-to-node reports are available."

Herman added, "If one can monitor who is working within what information, one gains an insight into how the corporation is operating."

Steps to alleviate limitations

Although today's network management tools are inadequate, Hall listed steps to help alleviate the limitations.

First, he claimed that companies should build flexibility into a network. "New applications will be developed, departments will move to other areas and departments will be reorganized," Hall said. To solve these problems, he recommended that all buildings be wired with a common network topology. "A user should be able to plug into the network no matter where he is working." Yet, this approach is expensive, Hall said.

Another aid is assigning someone with network manager responsibilities at each node. Each manager is supplied with a tool kit that includes software tools, documentation, training materials and network policy guidelines. "The tool kit prevents different departments from having to reinvent the wheel," Hall noted.

Hall concluded that these steps can only be moderately successful because real-time maintenance and security tools are not yet available.



WHEN YOU INTEGRATE VOICE AND DATA SYSTEMS, WE CAN HELP YOU AVOID THE RISKS.

When it comes to integrating voice and data systems, one wrong step can prove disastrous. That's why it pays to have someone on your side who knows the ropes. PacTel Communications Systems.

We took the time to evaluate all the available voice and data products so you won't have to. So while most voice and data suppliers sell you only the equipment they make, we set you up with the solutions you need.

We start by carrying only products designed with an Open Architecture, from such reputable manufacturers as Northern Telecom, Data General, Codex, Timeplex and C. Itoh. Our rigorous evaluation ensures these products to be the most reliable, compatible and cost-efficient on the market today. Besides working with one another, they can

COMMUNICATIONS

MODEL from page 67
populations.

Network models also assume that blocked calls are not retried, when in fact these calls are rarely lost and may indeed be retried within seconds, particularly with autodialers, CPU-originated traffic and camp-on routines of smart message terminals or switches.

For example, a typical problem recently analyzed by this author consisted of a

CPU in a metropolitan area calling a sparse population of terminals in a smaller city to deliver electronic mail. After receiving messages from the sender, the CPU was programmed to attempt to route the message within one minute for up to 60 tries — with the interval made slightly longer as the number of attempts increased — before re-scheduling the call.

In other words, the model suggested use of fewer communications facilities for

this application than were actually needed because of the number and frequency of the retries.

Another assumption made with optimization models is that traffic patterns are consistent, when in fact they vary by the time of day and week and by the source of the traffic.

Even discounting the first and second points above, there is no guarantee that a given population will behave with any certainty in an in-

ternistically smooth fashion. Monday and Friday morning traffic may resemble shock waves. And CPU-generated traffic may be almost deterministic at high load — as when a buffer fed by bulk storage empties out to a line every 10 msec — and bursty at lighter loads.

Generally the traffic may be mixed from several radically different sources, including data and voice input to a private-branch exchange and incoming local telephone

traffic vs. incoming national toll traffic vs. incoming international traffic. Traffic times may be a function of the time of day, message content and other factors. Traffic patterns at business centers differ from those characteristic of rural and semirural areas.

A last assumption made in many optimization models is that all users are independent of each other, when in fact the opposite might be true. Consider the problem of determining the number of foreign exchange lines needed between a centralized customer service center and

77

Practitioners who design networks must make do, if not hundreds, of assumptions and engineering judgments often ignored by optimization models.

a node in a star-configured data communications network. All data customers go through a concentrator in the remote city. A failure in the concentrator or communications line would prompt all customers in the given city to call the centralized customer service center. These calls would not be independent of each other.

Practitioners who design networks must make dozens, if not hundreds, of assumptions and engineering judgments often ignored by optimization models. In the end, they may very well wonder if the cumulative sum of all errors — a few of which were described above — suggests use of the incorrect number of facilities. Indeed, the issues described above may be in part responsible for the degraded service sometimes experienced by a number of public and private networks.

Yet, one rarely finds these issues treated in the thousands of queuing models available. In particular, very little is done in modeling that addresses customer behavior, not only in the traffic area but in market dynamics, vendor loyalty, tariff and pricing sensitivities and reaction to quality/degradation of service.

also be integrated with most of the stand alone PCs, word processors and local area networks your office already uses. And with most of the new automation equipment you'll use in the future.

And when it comes to support, we won't leave you hanging. Whether you need something as simple as a few modems or as complex as a totally integrated digital voice and data system, we'll have it up and running in no time. And we'll back it up with our exclusive High Performance Service. So if you're up in the air about integrating voice and

data, remember the voice and data supplier that can get you there one step at a time.

CALL PACTEL AT 800-556-2020, EXT. 855.

THE SIMPLE SOLUTION.

PACTEL
Communications Systems



Only Sperry can make the following four statements.

Our PC runs the XENIX™ system, as well as MS-DOS™.

Our 4 new microcomputers run the UNIX system.

Our new minicomputer runs the UNIX system.

Our Series 1100 mainframes run the UNIX system.

All of which means there is a great deal we can do for you.

For instance, our family of computers based on UNIX systems has incredible transportability for all your software.

And being able to accommodate from two to hundreds of users, it's impossible to outgrow our hardware.

Of course, this linking of all your computer systems can add measurably to your productivity. And a fast way to find out

more is to get a copy of our Sperry Information kit. For yours, or to arrange a demonstration at one of our Productivity Centers, call **1-900-547-8362**.

*UNIX is a trademark of AT&T Bell Laboratories
XENIX and MS-DOS are trademarks of Microsoft Corporation
© Sperry Corporation 1985.



**Introducing an idea
that makes obsolescence obsolete.**



**The UNIX* operating system
from PC to mainframe.**

SYSTEMS & PERIPHERALS

Wait dulls STC 8380E luster

By Charles Sahasrabudhi
CIO New York Bureau

NEW YORK — Claiming the bad times are over and the good times are about to roll, Storage Technology Corp. (STC) made official its plans to counter IBM's dual-capacity 3380 disk drive with the 8380E, a field-upgradable version of its 8380 disk drive that industry watchers said has one significant flaw: It will not be available until a year after IBM begins volume shipments of its double-capacity 3380s.

The 8380E, with 5,040 bytes of storage, a 17-msec access time and a data transfer rate of 3M bytes/sec., matches IBM's 3380 double-capacity drive announced in February. In fact, STC's and IBM's approaches to the double-capacity drives are similar. Both retained the thin-film read/write heads that caused problems in early ver-

sions of the 3380 and 3380 drives. And both companies created the double-capacity models by increasing the ratio of tracks per inch on the unit's disk platters (STC chose a slightly larger disk platter in its 8380E).

ANALYSIS

But there are also glaring differences between the two products. STC's drives are field upgradable. Current 8380 users can convert their drives to the 8380E models by replacing 13 circuit boards, the head disk actuator and the drive motor. Since the components fit into the same cabinet, no additional space is required for the double-capacity unit, STC said.

IBM's dual-capacity 3380s are only upgradable from single-capacity 3380s announced in February. Users of older 3380s cannot upgrade to the double-capacity unit, STC said.

See STC page 80



RAISED TAPE
Tom Husted
CIO Texas Bureau

STC, Memorex: Grim futures?

Storage Technology Corp. (STC) and Memorex Corp., generally viewed by industry watchers as being among the more lustrous companies in the IBM-compatible products business, both unveiled answers to IBM's double-capacity 3380 disk drive recently, ironically choosing the same New York restaurant in consecutive weeks to make their announcements.

See IBM/STC page 82

NCR introduces low-end, multiuser Minitower

DAYTON, Ohio — NCR Corp. has added a low-end addition to its Tower line of supermicrocomputers called the Minitower, a system that can support from two to eight users.

Based on Motorola, Inc.'s 68010 microprocessor, the Minitower supports NCR's derivative of AT&T's Unix System V operating system, Tower Operating System V. The unit is software compatible with two larger members of the Tower family, the Tower and Tower XP, but comes in a cabinet that is 35% smaller than the earlier models, the company said.

The Minitower reportedly can function as a stand-alone, entry-level system or as part of a distributed network supporting IBM System/38 Data Link Control or X.25 protocols. The Minitower's TowerNet communications package can interface with an Ethernet local-area network via the Xerox Network Service link-level protocol.

In an IBM Systems Network Architecture (SNA) environment, the Minitower can function as a Physical Unit Type 2 cluster controller node. Also, when operating under SNA, users can add various emulation packages that allow the Minitower to function as an SNA RJE device, emulate an IBM 3270 terminal or emulate an IBM 3275 printer, the vendor said.

With a base price of \$6,995, the Minitower features 615K bytes of main memory, 35M bytes of Winchester disk storage, 3.5-in. floppy disk drive and a 386K bytes of control memory.

See NCR page 42

Wang enhances small business CPUs, operating system

LOWELL, Mass. — Wang Laboratories, Inc. unveiled two very large-scale integration-type (VLSI) versions of the company's 2300MVP small business system and an enhanced release of its multiuser operating system that can be used on the entire 2300 product line. The company will no longer sell the non-VLSI 2300MVP CPU, a spokeswoman said.

The price of the VLSI-type 2300MVP — CPU only — is \$4,000 for 128K bytes of memory, it is said to be a \$650 reduction from previous 128K-byte MVP CPUs. The 612K-byte model costs \$7,300, a \$3,000 reduction from previous 612K-byte MVP CPUs.

A system configured with 128K bytes of memory, a terminal, a disk drive and a parallel printer, one 54-in. 10M-byte disk and a 350K-byte floppy drive costs approximately \$6,000, the vendor said.

The company claimed up to a 70% reduction in monthly maintenance for the VLSI-type CPUs, from a range of \$67/mo to \$200/mo for the previous MVP CPUs to a range of \$42/mo to \$67/mo for the VLSI-type MVP CPUs.

The 2300MVP and the Micro VP CPUs employ processors from VLSI Technology, Inc. of San Jose, Calif., which are said to allow the replacement of from seven to nine 8- by 11-in. printed-circuit boards with a single board that includes 32K bytes of control memory.

The VLSI-type 2300MVP (available now) combines the newly announced board in the traditional 2300MVP packaging, and the Micro VP, available in July, features smaller packaging. Each system accepts nine optional peripheral controller

See Wang page 82

We rent out as much equipment as Ryder rents out trucks.

Personal computers, terminals, printers, modems. Loaded with options: rentals, leases, options to buy, volume pricing. Rent the best from the best: Leasametric.



LEASAMETRIC

*DATA COMMUNICATIONS DIVISION

California:
Northern California:
Southern California
and Rocky Mountains:
Southeast:
Central:
Northeast:
Pacific Northwest:

(415) 874-4700

18003 880-4874

18003 241-0911

18003 530-4923

18003 221-0248

0000 885-0988

*Minimum one-year rental agreement.
Reserve Deposit, other fees assessed as Ryder Truck Rental.
Some equipment options, not available/limited. See dealer for details.

Report foresees dilating vision-capable robot mart

Systems more flexible, safer but expensive

By Susan Reinhold
Clt Staff

NEWARK, Conn. — To see or not to see? That is the big question for robot users in the next few years.

About 80,000 of the 250,000 industrial robots purchased in the next 10 years will be equipped with vision capabilities, according to a report, "Robot Vision Systems," issued by International Resource Development, Inc. here.

Vision-capable robots will be able to operate with much more flexibility

and safety than "blind" robots, the report said. But they're expensive, each costing roughly \$150,000 now. The report also stated that the cost of robots that can see will fall rapidly as they become more common.

Buyers are choosier

Early robot vision systems have been plagued by reliability problems and design bugs, the report said, and buyers are "rightly skeptical" of vendors' performance claims.

Robot vision systems use television cameras or charged coupled-device scanners, with the output from either passing through image processing and data processing subsystems. The camera or scanner can be

mounted in the body of the robot (eye in shoulder) or in the robot's grippers (eye in hand), the report said. The robot's performance is strongly determined by the power of the signal processing electronics, the report added.

Older versions of seeing robots needed careful floodlighting or back-lighting of the work area, the report noted. Later model seeing robot versions include signal processing semiconductor sets with special image processing capabilities that reduce the need for specialized work area lighting.

Far too many vendors are aiming at the robot vision system market, the report said, identifying more than 16 serious participants. As the

market grows, "the heavyweights are moving in," it added. "General Electric Co., General Motors Corp. and IBM may soon have pushed out or acquired most of the smaller firms."

Continue to cost more

Vision-capable robots will continue to cost substantially more than blind robots, but the total installed price to users is sometimes less, the report observed.

Blind robots require special conveyors and other systems to present work pieces at precisely the right time and in the right place. Vision-equipped robots need fewer special fixtures around them, it said. They can pick parts out of bins, orient them correctly and more easily recognize problem conditions and error-

What You Need To Know About Network Management...

Managing Complex, Multicarrier/Vendor Network Diagnosing Faults Creating Carrier Gateways Interfacing Voice, Data, and LAN Equipment Optimizing Hardware, Traffic and Software Opportunities

Attend the
2nd annual
conference &
exposition in
your area.

NETWORK MANAGEMENT TECHNICAL CONTROL

Education
Information
Technology
Solutions

SAN JOSE: June 24-27 **San Jose Convention Center**
CHICAGO: Nov. 18-21 **Holiday Inn O'Hare**

First program and show to ZERO IN on multi-carrier/vendor network operating headaches • See new tech control and software solutions • Self-diagnostic modems & components • Hardware for network optimization, measurement, feedback & performance monitoring • Local network management and interfaces

Learn of In-Depth Seminars
June 24 & 25. Instruction:

Choose from 46 "How-To"
Conference Sessions June 26 & 27



Byron
Holtzman



Stephen
Klein



Edgar
H. Cohen



Stephen
H. Cohen



Mayfield
T. H. Breyer

Show Sponsors: Cose Rina Communications, Datacom Management Sciences, Dynatech Data Systems, Inco-Netco, PLUS some have down other exhibitors

Exhibitor Open: San Jose Convention Center, June 26, 10:00 to 5:00, and June 27, 10:00 to 3:00.

Managed by the team that brings you COMBINATION NETWORK Call 800-228-4696 for full program and exposition information (In Mass., 617-679-0700)

Or mail coupon to NMT/TC, CW/Conference Management Group, Box 860, Framingham, MA 01701

NETWORK MANAGEMENT TECHNICAL CONTROL

Conference and Exposition
Box 860
Framingham, MA 01701
617-679-0700
Outside MA 800-228-4696

☐ YES, register me now for the 1985 NMT/TC Conference in San Jose, June 24-27, 1985

☐ CANCELL ONLY

☐ Full Two-day Conference - Tu/We/Fri

☐ Expo (includes luncheon) - \$295.00

☐ Other May 29th, 1985 - \$185.00

☐ "No-Tech" luncheon only - \$100.00

☐ Luncheon only - \$50.00

☐ Advanced registration required. Please add \$10.00

☐ Please send exhibit information. ☐ Please send further registration information.

☐ Please send me a copy

☐ Name & Title

☐ Company

☐ Street, P.O. Box

☐ City, State, Zip

☐ Telephone () Ext.

☐ Check Enclosed ☐ MasterCard/VISA ☐ American Express

☐ Bill Me ☐ Bill Company (P.O. #)

☐ Card # Exp. Date Signature

☐ I have made this form, checked information and will use it as a card for selection at specific technical sessions.

Registration cancelled after June 20 will subject to a \$10.00 service charge. Registration may be transferred at no charge.

Supermicro firm unleashes Zebras

ANAHEIM, Calif. — General Automation, Inc. has introduced the Zebra 1760 and Zebras 6700 supermicrocomputers. Both machines are based on the Pick Systems Pick multiterminal operating system, according to General Automation.

The Zebra 1760 is said to support from six to 12 terminals and to offer 128K bytes to 1M bytes of memory with zero wait states and 30M bytes to 120M bytes of hard-disk storage. Also available is a 5 1/4-inch removable cartridge disk drive and/or a 4 1/4-inch streaming cartridge tape drive for backup.

The 6700 reportedly features the Motorola, Inc. MC68000 microprocessor, 1.3M bytes of memory (expandable to 2.25M bytes), 300M bytes of hard-disk storage and support for up to 64 users.

Also included is a backup battery power supply and a security key switch among other features, according to the vendor.

The Zebra 1760 is available at \$9,950. The Zebras 6700 is priced at \$96,500, the vendor said.

More information is available from General Automation, located at 1046 South East St., Anaheim, Calif. 92805.

The more serious you are about dial modems, the better we look.

Talk to most so called "networking companies" about point-to-point dial networking and you'll probably get a big song and dance, but very few products.

Codex, on the other hand, offers a complete repertoire of dial modem solutions. To meet any need.

*McGraw Hill's "Data Communications" magazine rated us as having the best technology and price/performance.

should be talking to us, too.

Call 800-426-1212.

Ext. 224. Or write
Codex Corp.
Dept.
707-224
20 Cabot
Boulevard,
Mansfield
MA 02048.

We offer a full line of 2400 bps modems, proven in benchmark studies to be more accurate, more reliable over degraded lines than any other modems on the market.

We offer Bell-compatible and international modems.

We even offer modems that have a sophisticated error-correcting feature.

The fact is, we offer the most complete dial modem line in the industry.

Which means one thing: when you talk to a Codex applications expert you're talking to a person who can be totally objective in recommending products for your environment.

Maybe that's why in a recent industry wide survey we were chosen as the preferred modem supplier.

Maybe that's why you



codex

 **MOTOROLA**

© Copyright 1985 Codex Corp.

SYSTEMS & PERIPHERALS

PROCESSORS

Computer Consoles, Inc. has released its Floating Point/Math Accelerator, an addition to its Powerd family of microcomputers that runs under either the University of California at Berkeley 4.3 BSC or AT&T System V versions of the AT&T Unix operating system.

The Floating Point/Math Accelerator is a coprocessor that can be installed in a Powerd system to give floating-point capabilities. The accelerator is said to speed execution of math functions, such as sine, cosine, arctangent, log, exponent and square root.

The accelerator option costs \$16,500, and it will be available in the second quarter of 1985.

Computer Consoles, 97 Humboldt St., Rochester, N.Y. 14606.

Orvatech, Inc. has announced its Advanced Graphics Processor (AGP), which is a replacement for the existing graphics processor in the Orva 3000 and 3000 AT&T Unix-based graphics workstations.

Combined with the Unix system and the Programmer's Hierarchical Interactive Graphics Standard Implementation, the AGP is said to provide users with a two- and three-dimensional graphics engine.

The processor is a three-board unit that consists of a display list processor, a transformation and floating-point processor and a drawing processor.

The unit costs approximately \$10,000, and it will be available in the fourth quarter of 1985.

Orvatech, 1009 Morrison Drive, Ottawa, Ont. Canada K2H 8K7.

AMF Logic Sciences, Inc. — a subsidiary of AMF, Inc. — has announced its Turbo-graph 300 vector-to-vector graphics processor that was designed for OS/2 and systems integrators.

The Turbo-graph 300 can produce lines in formats such

as solid and dashed, polygons with user-definable shading and color patterns, circles and ellipses and color and gray-level control. The display can be scaled and rotated, the vendor said.

Standard input memory is 128K bytes and can be upgraded to 512K bytes to store up to 80,000 vectors. Connections are available for the RS-232C serial interface, Centronics Data Computer Corp.'s 8-bit parallel interface or other interfaces as specified by the OEM. Options include an integral board for the IBM Personal Computer, an integral printer/plotted board and a standard desktop cabinet for storage.

The retail price is \$1,395 with discounts for OEMs. AMF Logic Sciences, 10600 Follensbee Road, Houston, Texas 77066.

TERMINALS

Intertec Corp. has announced its Model 6180 color graphics terminal that is compatible with Digital Equipment Corp.'s VT100 and Tektronix, Inc. 4016 terminals.

The terminal has 1,024-by-768-pixel resolution and can display 64 colors simultaneously. Graphics commands such as pan, zoom and polygon fill are built in, according

to the vendor.

The terminal's cost, \$5,875 each.

Intertec, 225 Technology Park, Norcross, Ga. 30092.

Vermeer has released an end-user workstation for its computer-aided engineering (CAE) design system. Now that runs on Vermeer Expert engineering applications software modules and Xerox Corp. Star office automation software.

The 3011 workstation has 768K bytes of main memory, a 1.2M-byte double-density floppy disk drive and a 104-byte Winchester disk drive. Upgrades

include a 42M-byte Winchester disk and a 1.4M-byte main memory.

Features include 800-by-1024-pixel resolution, multiple windows, zoom, optical mouse and internal Ethernet interface, the vendor said. Using the Expert VAX Ethernet interface, the workstation can access Digital Equipment Corp. VAX series programs and data, move Expert files to VAX for processing and displaying VAX applications and results in the workstation's VAX window.

The workstation costs \$45,995 for the basic system, and the workstation with expanded memory is \$10,500. Vermeer, 8710 Walsh Ave., Santa Clara, Calif. 95051.

Where program their

If you want to take a look at programming from a different point of view, take a look at a Smart Desk equipped with an IBM 3270 Personal Computer.

The screen of the 3270 PC can be divided into several windows—including multiple PC sessions and up to four host sessions from the same or different computers.

In the blue window you can keep a menu of your function keys. It's easy to log on and connect to a host system for browsing a program listing in the yellow window.

By edit a second program, a single function key can download the source code to a PC session in the red window.

And, when you're finished editing, another function key can send the revised program back to the host.

Then multiple windows are available in eight colors. They are ideal for reviewing more than one program at once. Or for the concurrent viewing and testing of source code.

The end result is faster and more accurate programming with less demand on the host.

Any window can be viewed full screen for detailed analysis. Or it can be sized and moved to any area of the screen, so you can create the screen format that works best for you. You also get two handy notepad windows.

And, of course, the 3270 PC is backed by IBM's commitment to service and support.

One more point to keep in mind: The 3270 PC is available in quantity

discounts. Your IBM marketing representative has all the details.

And if you want to receive literature on how the 3270 PC can expand your programming capabilities, call 1 800 IBM-2468, Ext. 90 or send in this coupon.

IBM

☐ IBM Dept. CP270
3270 Personal Computer
Business Edition, 30 40 47

☐ Please send me more information on the IBM 3270 Personal Computer.

☐ Please have an IBM marketing representative contact me.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____



"Well, at least it wasn't a foreign computer that replaced me."

The Smart Desk from IBM

SYSTEMS & PERIPHERALS

POWER SUPPLIES

■ Ault, Inc. has released a 50W universal power supply that is suitable for powering computer peripheral equipment, disk drives, CRT displays, microprocessors, multiplexers, modems and other data communications equipment.

The plug-in supply delivers 5A at 5V dc, 2A at +12V dc and 0.5A at -12V dc, according to the vendor.

It costs \$60 in OEM quantities.

Ault, 1000 Broadway Blvd., Minneapolis, Minn. 55410.

BOARD-LEVEL DEVICES

■ National Advanced Systems, Inc. (NASI) has unveiled the Single Board Solution, a circuit board that is said to provide a communications link between IBM

Personal Computers or compatible microcomputers and IBM Systems Network Architecture host processors.

The board uses one slot in a Personal Computer or compatible microcomputer and does not require user programming. It emulates an IBM 2274 Model 51C or 51C cluster controller and supports up to 16 concurrent sessions. It also provides synchronous host communications at up to 8.0K bit/sec., the vendor said.

The board consists of a National Semiconductor Corp. NS32014 CPU chip and 512K bytes of memory. It costs \$1,495 and is available immediately.

NAS, 800 E. Middlefield Road, Menlo Park, Calif. 94046.

AUXILIARY EQUIPMENT

■ LP COM has introduced a

portable Telecommunications Test Computer that runs under IBM PC Corp.'s MS-DOS operating system.

The Model TC-3000 contains built-in self-diagnostic tests, a communications software package that includes a calculator, calendar and notepad. Systems are configured according to the user's needs for digital, analog or both testing functions.

A basic TC-3000 with Transmission Instrument Measurements (TIM) test instrument software and a Signaling/Supervision package for full signaling and testing capability — for analog testing — costs approximately \$15,000.

A basic TC-3000 with the Protocol package for monitoring, trapping, simulation and analysis capabilities in a digital environment costs approximately \$14,000. A fully loaded system with all capabilities costs approximately \$27,000, the vendor said.

LP COM, 21000 Homestead Road, Cupertino, Calif. 95014.

■ Dymaport, a division of Rohart Corp., has announced its DCCS 9000 Data Supervisory Management (DSM) system that controls and manages Dymaport printed-circuit board insertion equipment.

The Dymaport DCCS 9000 DSM system features a central data base that develops, edits, transfers and stores printed-circuit board programs for up to 20 axial, dual in-line package and odd-form insertion equipment (machines that automatically assemble printed circuit boards), the vendor said. It polls each insertion machine hourly for information such as how many components were inserted or misinserted, time of operations and so on, which can later be extracted for management reports, the vendor said.

The system has 256K bytes of random-access memory, dual floppy disk drives and a monochrome terminal for \$21,000. Options include a color terminal and printer interface.

Dymaport, Suite 105, 148 Linden St., Woburn, Mass. 02116.



"Nobody remembered his birthday."

mers can expand fields of vision.

SYSTEMS & PERIPHERALS

STC from page 75

models. This field-upgrade feature gives STC a marketing edge over IBM, but the long delivery schedule for the 8380E and STC's already shaken reputation — as a result of its filing for Chapter 11 under the Federal Bankruptcy Act last October — seems to mar its attempts to make a strong comeback against IBM.

Why it is taking STC so long to bring the 8380E to the market is a puzzling and perhaps critical issue for STC. Ryal B. Poppe, chairman and chief executive officer of STC, said the company wants to make sure the 8380E is reliable. Even though STC is claiming it has already installed 2,000 of the 8380E units, Poppe claimed that to ensure reliability, the company wants to complete quality testing.

'Mostly, [the 8380E announcement] helps convince customers that Storage Technology is not going away.'

— Michael Gernan
E. F. Hutton & Co.

Since the 8380E is the first product STC has announced since its Chapter 11 filing, embarrassing technical problems with the unit would indeed be devastating. In that sense, Poppe's concern for quality is absolutely justified. But the noble quest for quality seems to pale when viewed in the context that IBM will be making volume shipments of its double-capacity 3380 for a year before STC can gear up volume ship-

ments of its 8380E.

"Mostly, [the 8380E announcement] helps convince customers that Storage Technology is not going away," said Michael Gernan, an analyst with E. F. Hutton & Co. in New York. It also gives customers a reason to go ahead and buy a single-capacity 3380 drive, he added.

"It looks like [it has] the technology to do it," Gernan said of STC's attempted comeback. "But will the

window be open long enough? The fourth quarter of 1986 is a long ways away."

The field upgradability of the 8380E could keep the 8380s moving out the door, said Robert H. Katsive, vice-president of Disk-Trend, Inc., a Los Altos, Calif., market research firm.

"IBM has a little problem there," since until recently the 3380 drive was shipping even though it was supposed to double-capacity machines, Katsive said.

But IBM has already shipped an impressive number, about 3,000 units, of the single-capacity 3380s that can be upgraded to double-capacity models. At that rate, one analyst estimated, IBM could ship 45,000 spinners, or 30,000 units, of the upgradable single-capacity models by the year's end, when the double-capacity upgrades become available.

In 1983, STC had 20% of the market for large-scale, 600M-byte drives, according to Disk-Trend's last published figures. That share has dropped in the face of the Chapter 11 filing, Katsive said.

Orders 'below expectations'

Poppe admitted orders for the 8380 were below expectations in the first quarter. If the pace does not pick up during the rest of the year, the Louisville, Colo., firm would realize about 60% of its anticipated \$700 million in annual revenues, he said.

Poppe noted, however, that STC has cut its work force from 16,000 in 10,000, and its service revenues have continued to grow through the Chapter 11 proceedings. It only needs 8% to 9% of the large disk drive market for the company to be profitable, he said.

STC also announced an upgraded 8380 cache disk controller, which can be field-upgraded to contain up to 7344 bytes of cache memory. The previous version contained 18M bytes. The upgrade is made possible by substituting 256K dynamic random-access memory chips for 64K-byte chips, according to STC.

Poppe also vowed that STC's optical disk project, although severely cut back earlier this year, is not dead. A team of 40 employees continues to work on the optical disk drive that is supposed to be compatible with IBM 3380 systems. An announcement on the product will come in 1986, Poppe said.

STC claimed to be working on its own version of the IBM 3480 tape drive, with an announcement to come later this year, he said.

The double-capacity 8380E costs \$108,300, an STC spokesman said. The field upgrade of the single-capacity to double-capacity drive will cost \$46,000, bringing a \$63,100 single-capacity 8380 into line with the cost of the double-capacity unit, spokesman said.

STC is located at 2270 S. 86th St., Louisville, Colo. 80028.

New Version

Classic COBOL.

True mainframe COBOL for your microcomputer. Validated by the GSA at the highest possible level of compliance with the ANSI 74 standard. With Microsoft® COBOL, mainframe programs can be productive on MS-DOS™ and Microsoft XENIX® microcomputers immediately.

Speed and Beauty.

High performance in a COBOL program comes mostly from the speed of the ISAM. And Microsoft COBOL 2.0 has the fastest ISAM on the market.

And our advanced screen handling capability lets you create the highly interactive programs that end users prefer.

We wrote the book.

It's no surprise that IBM®, DEC®, AT&T, H-P and Wang® all chose Microsoft COBOL for their MS-DOS machines. We know how to get the most out of their microcomputers. After all, we designed the operating system.

So call (800) 426-9400. In Washington State, Alaska, Hawaii and Canada, call MICROSOFT® (206) 828-8080. The High Performance Software. We'll give you the name of your nearest Microsoft dealer or help you update to Microsoft COBOL 2.0.

- Certified High Level Compiler
- GSA validation at the Federal High Level of compliance with the ANSI 74 standard.
 - Built in sort-merge, chaining, dynamic calling, and overlays.
 - Fast multi-key ISAMs
 - Split-keys and duplicate keys.
 - Benchmark results of X000 reads and writes to an ISAM file:
- | Microsoft COBOL 2.0 | IBM COBOL | DEC COBOL | H-P COBOL | Wang COBOL |
|---------------------|-----------|-----------|-----------|------------|
| 1:32 | 1:56 | 2:58 | 3:30 | |
- Interactive extended screen sections
- Cursor positioning, auto skip, automatic data field formatting.
 - ACCEPT and DISPLAY data by the screen full.
 - Productivity utilities
 - Interactive Symbolic Debugger
 - Rebuild file recovery utility removes corrupted ISAM files.
- Prices
- \$200 for compiler and utilities.
 - No runtime royalty fees.
- Minimum System requirements
- MS-DOS 2.0 or later, 192K RAM, and one disk drive.
 - Xenix 286, 512K RAM, and one disk drive.

Microsoft and Xenix are registered trademarks and The High Performance Software is a trademark of Microsoft Corporation. IBM is a registered trademark of International Business Machines Corporation. DEC is a registered trademark of Digital Equipment Corp. Wang is a registered trademark of Wang Laboratories, Inc. The difference is a registered trademark of Microsoft. Microsoft is a registered trademark of Microsoft Corporation.



"That's enough! Now I know why they call it high-tech!"

In June, we'll help you turn out profits on an assembly line.

Manufacturing industries are getting more competitive every day, with enormous pressures to improve productivity methods. Which is why so many manufacturing companies are beginning to see the true potential of increased computerization.

And the result is new partnerships between MIS/DP, production, and design management. So in the June 19th issue of *Computerworld Focus*, we'll tackle industrial automation, one of the fastest growing segments of the computer industry today.

We'll put CAD/CAM, robotics, local area networks and MRP in perspective. Then discuss ways to link dedicated manufacturing computers with the corporate information system to integrate the entire process, from engineering design to assembly to quality control to inventory control to shipping to billing all the way to accounts receivable.

And we'll reach more than 126,000 paid *Computerworld* subscribers with that information. Not to mention our high pass-along readership. As well as bonus distribution at Advanced Manufacturing Systems '85 in Chicago.

But that's not all you'll get for your advertising dollar. Because Starch INRA Hooper will be performing a detailed advertising readership study on our June issue.* So you can see how effective your ads are. And how effective your competitors' ads are.

So if you want to mass produce profits, your chance is here. Get your ads in *Focus*. *Computerworld Focus* on Manufacturing. The June 19th issue, closing May 10 (materials due one week later).

For more information, contact Ed Marecki, National Sales Director, *Computerworld Focus*, 375 Cochituate Rd., Framingham, MA 01701. Or call (617) 879-0700.

*A minimum size of 7" x 10" (500 lines) is required for ads to be eligible for a Starch study.

COMPUTERWORLD FOCUS

We put the hottest issues of the day in *Focus*.



BOSTON: (617) 879-0700 NEW YORK: (212) 967-1350 ATLANTA: (404) 394-0758 CHICAGO: (312) 827-4433
SAN FRANCISCO: (415) 421-7330 LOS ANGELES: (714) 261-1230 HOUSTON: (713) 952-1220

SYSTEMS & PERIPHERALS

DRIVES from page 75

However, each company's dual-capacity 3380 alternative is disappointing, which raises the question of whether either firm has a long-term future in the IBM-compatible peripheral business.

STC's approach, a field-upgradable, double-capacity version of its 3380 disk drive, called the 3380E (see story page 75), mirrors IBM's approach to the dual-capacity 3380. But delivering the 3380E a year after IBM begins making volume shipments of its dual-capacity models is like hauling water to a fire in a leaky bucket. STC is already way behind IBM in single-capacity 3380 shipments. If it holds firm on the fourth-quarter 3380E shipments, it will probably fall further behind.

Memorex managed to match IBM's

proposed fourth-quarter 1985 delivery date for the dual-capacity 3380 but with a far different disk drive. Memorex's 3680 IDP is a repackaged version of its 3650, which has eight head disk assemblies packed into one box.

Unable to announce product in time

The approach is clearly a novel idea that has some merit, but whether it will lure users away from buying the double-capacity 3380 is another question. Memorex is still promoting a double-capacity 3380-type product soon, but it is clear the company is simply not able to announce such a product in time to compete seriously with IBM's slated fourth-quarter deliveries.

However, it's the promises from STC and Memorex that are most intriguing — and most disappointing.

Both companies built their businesses on being able to deliver IBM-compatible peripherals sooner — and at more attractive prices — than IBM. Now the opposite appears to be the case. STC and Memorex still offer a price advantage, but IBM now has the strong upper hand on delivery. STC cannot deliver its dual-capacity 3380E until late 1985, and Memorex hasn't even announced a dual-capacity 3680 yet. Meanwhile, IBM appears to be gearing up for massive shipments of its dual-capacity 3380 in the fourth quarter of 1985 and early 1986, a move that could leave Memorex and STC in the dust.

STC's and Memorex's promises don't end with the dual-capacity 3380 either. It has been better than a year since IBM took the wraps off its 3480 tape drive, and so far neither Memorex nor STC has been able to

match the IBM announcement. Both companies made it clear at recent press conferences that 3480-compatible products would be forthcoming, but neither company could be very specific about when such products would arrive.

Memorex beefed up its support for the IBM 3420 marketplace with a tape caching subsystem and some additional tape control units, claiming there are many users who do not want to switch immediately from the 104-in. reel-to-reel 3420 format for the cartridge tape format used in the 3480. The company is wise to offer additional products to the 3420 marketplace, but the 3420 market is dying and will eventually become extinct. Granted, the end of the 3420 market will not come tomorrow, but if Memorex is betting on long-term profits from 3420s, it is in for a surprise.

Vows to build new products are certainly noble. But when users need solutions to tangible business needs, promises are of little help. Nor do promises do much for corporate bank accounts. Significant layoffs at both Memorex and STC are clear indications of that.

Already suffering from sagging sales as a result of stiffer IBM competition, neither Memorex nor STC is going to improve its current lot with promises while IBM ships truckloads of real products. Many people sincerely hope both Memorex and STC can turn current adversity into renewed success. But it just won't happen without real products. And unless IBM makes an enormous mistake that opens up a big window of opportunity for Memorex and STC, the future of both companies looks grim.

**BREAKTHROUGH:
A COMPUTER THAT
UNDERSTANDS YOU
LIKE YOUR MOTHER.**

**MCDONNELL
DOUGLAS**

NCR from page 75

a floppy disk drive capable of storing up to 1M byte of memory, eight RS-232C I/O ports and basic Unix software. For an additional \$755, users can purchase a Unix Extension Module, a collection of programs said to offer users more flexibility in configuring small disk-based systems. Modules include extra utilities, graphics software, documentation, software development, system accounting and communications software, NCR said. The Minisizer will be available this month.

NCR is located at 1700 S. Patterson Blvd., Dayton, Ohio 45478.

WANG from page 75

boards and can communicate with existing 2300 option boards and peripherals, the vendor said. Both machines support up to 15 users.

Both systems come with 32K bytes of control memory and can be ordered with either 128K bytes or 512K bytes of user memory. Four packaged configurations are available for either system.

Release 2.6 of the Basic-2 multi-user operating system that is required for the systems just announced is also available for all currently installed 2300 systems. This release features a generalized printer driver that allows 2300 CPUs to use the Wang Professional Computer Model PC-PM010 and PC-PM016 printers, the vendor said.

More information can be obtained from Wang. Our Industrial Ave., Lowell, Mass. 01851.



Many Software Companies Claim To Have Set Standards. Only One Has Actually Set Them Down On Paper.

"Every industry starts at a stage of 'every man for himself', and some industries never outgrow it. In the applications software business it has become obvious that a criteria of excellence is needed. Such standards will be the way by which customers and users will be able to compare products. It will give us all an idea of what application software should be."

The words above are taken from a 35-page white paper written by Software International, the company whose first general ledger package actually started the applications software industry 15 years ago.

Entitled, "Setting Standards In Mainframe Applications Software," the report may be the first of its kind—the first ever to set down on paper the standards appropriate for application software products.

In it are ten guidelines suggested as standards in the design of applications software as well as standards which cover product installation, customer service and support. In short, standards for how a professional software vendor should build his products and how it should treat its customers.

We think you will find it a concise, common-sense collection of ideas—particularly vital to you if you are evaluating software packages or developing your own.

It's yours for the asking.

Simply clip the coupon or call toll free 1-800-343-4133, in Massachusetts 1-800-322-0491.

Software International Corporation
One Tech Drive
Andover, MA 01810

Dear Sirs: Please send me a copy of "Setting Standards In Mainframe Applications Software."

Name/Title _____
Company _____
Address _____
City _____
State _____ Zip _____
Phone _____



**SOFTWARE
INTERNATIONAL**

Software Thinking That's Impossible To Ignore.

COMPUTER INDUSTRY

Sterling launches proxy fight

By Kathleen Burton
CW West Coast Bureau

DALLAS — Spurred by the board of directors of Informatics General Corp., Sterling Software, Inc.'s cash buy-out offer will be placed before Informatics shareholders at that company's annual meeting May 9, Sterling declared.

Sterling, which first offered \$25 per share and later upped the offer to \$30 per share, said it will seek election of two proxy-taker directors and defeat of an anti-takeover provision scheduled for vote at the Informatics meeting.

After its second offer was rejected by the Informatics board, Sterling declared in a statement, "It now appears that we have no choice but to proceed with a proxy solicitation to defeat the anti-takeover proposal and elect two Sterling nominees to the Informatics board who will be committed to produce a merger with Sterling, which we believe is in the best interest of all stockholders."

Sterling, based here, placed advertisements in newspapers asking Informatics shareholders to sign new proxies in opposition of the anti-takeover vote and in favor of the election of Samuel Wity and Sterling L. Williams to the Informatics board. Wity is chairman and Williams is president and chief executive officer of Sterling.

Informatics declined to comment on the latest round in the takeover attempt. Sterling had acquired 9.3% of Informatics stock on the open market prior to making its first cash offer. The bulk of Informatics shares are held by institutional investors.

In an earlier statement, Wity, Informatics chairman and president of Informatics, said the company's board rejected the original offer because it was "not in the best

See Takeovers page 88

Exec says U.S. will act to curb imports of Japanese products

By William Weller
CW Staff

WELLESLEY, Mass. — Japanese markets will remain cool to American high-technology products, and the U.S. government will institute its own protectionist trade measures, according to Neilson Semiconductors Corp.

Chairman Peter J. Sprague.

Sprague called the current semiconductor industry slump "dreadful" but predicted recovery later this year based on rejuvenated demand from computer and electronics manufacturers.

Sprague was interviewed here recently at his induction into Babson College's Academy of Distinguished Entrepreneurs. He was honored along with Australian publishing magnate Rupert Murdoch and People Express Airlines, Inc. founder Donald Calvin Burt.

Regarding current trade tensions, Sprague

said Japanese promises to open trade doors are more lip service. "It's all semantics. Even if they removed the official barriers, it wouldn't make much difference anyway. I tried to open a consumer electronics store in downtown Tokyo, and it took a year and a half just to rent the space and set up."

"It's just a very restrictive country. Remember, we're talking about a place that in 1975, under full world pressure, decided to allow all of 114 Vietnamese refugees into the country."

Sprague predicted the U.S. will eventually respond with trade restrictions of its own. Such restrictions could include surcharges that would apply to National Semiconductor's National Advanced Systems Corp. (NAS) mainframes made by Hitachi Ltd. in Japan, he said.

"Protectionism will happen here," Sprague said. "And if it's an across-the-board

See COMPS page 98

Sprague, left, and Murdoch

Adapso calls tax bills costly

By Kathleen Burton
CW West Coast Bureau

SAN FRANCISCO — Federal tax reform proposals coming up before the U.S. Congress this year could cost computer companies millions in tax dollars if enacted, according to I. Stigum Mosley, vice-president of Management Science America, Inc.

During a meeting on federal tax issues at the Association of Data Processing Service Organizations, Inc. (Adapso) conference held here recently, Mosley said three tax reform proposals now before Congress

could seriously affect the computer industry: the U.S. Department of the Treasury proposal, a second draft of which is scheduled for release May 15; a plan proposed by Rep. Jack Kemp (R-N.Y.) and Sen. Robert Kasten Jr. (R-Wis.), and a proposal by Sen. Bill Bradley (D-N.J.) and Rep. Richard Gephardt (D-Mo.).

Although some proposals claim the tax reform proposals would benefit high-tech companies more than traditional manufacturing companies — they would lower historically high tax rates incurred by

See TAX page 98

Chief says DG will focus on OA mart

By Glenn Weller
CW Staff

BOSTON — Despite its recent profit slump, Data General Corp. is confident it can shift focus from its traditional industrial and scientific computer applications markets to office automation, DG Chairman Edward B. De Castro told a recent meeting of security analysts here.

De Castro said the company's second-quarter slump was most acute in sales to industrial, scientific and OEM customers (CW, April 29). He also noted that sales of the Data General/One laptop micro were still "below expectations" but that DG Dinkytown Generation micro and other OA products continue to sell well.

The Woburn, Mass.-based mini-computer maker reported earnings of \$9.1 million in the quarter ended March 29, down from \$14.3 million reported in the previous year. Per-share earnings slipped from 56 cents to 34 cents.

Expanding the quarterly results, De Castro cited

weak orders from domestic customers, a marked drop in demand for DG's 16-bit Eclipse minis from OEMs and sluggish industrial markets due to the falloff in capital spending.

"We are down in our traditional strength of sales of 16-bit products to OEMs for medical, technical and computer-aided design and engineering applications," De Castro said. "These markets are moving to 32-bit systems, but the transition has been slow to occur, especially among electronics and semiconductor manufacturers."

De Castro predicted that the company's next significant growth area will be large-volume sales of high-end 32-bit OA products and integrated personal computers to both the private and public sectors.

The office integration market is only beginning, and we have found our business mix shifting more rapidly to business automation," he said.

"In sales to the federal government, the OEM is becoming less dominant as the need for integration

See DG page 10

Computervision loss exceeds projections

NEWPORT, Mass. — Computervision Corp. last week announced a first-quarter loss of \$15.5 million, or 56 cents per share, somewhat more than earlier projected.

The company announced last month (CW, April 15) the dismissal of 15% of its work force, some 850 employees, after projecting a first-quarter loss no higher as \$15.7 million. The actual loss was higher due primarily to one-time costs of reducing operating expenses, the company said.

The loss compares with year-earlier profits of \$16.3 million, or 57 cents per share. Revenues for the quarter was \$105.8 million, down 13% from year-earlier revenues of \$121.7 million.

Despite the financial setback, which followed fiscal year 1984 profits of \$47.7 million on revenues of \$466.3 million, James E. Barrett, the company's president and chief executive officer, said, "the company continues to maintain a strong balance sheet."

Computervision said the adverse results were due to a sluggish economy, operating expenses based on higher than achieved revenue and a stretch-out in the sales cycle due to the transition of the company's product line.

COMPUTER INDUSTRY

Nixdorf exec blasts German PTT for impeding progress

By Susan Mahoney
Of Staff

HANDROVER, West Germany — In a fiery opening day address at the recent Hannover Fair here, Nixdorf Computer AG's founder and president, Hans Nixdorf, charged the West German Postal Telephone and Telegraph (PTT) authority with obstructing technological progress in the country.

According to this patriarch of the Federborn, West Germany-based computer firm, the German PTT is grossly inefficient, expensive and anachronistic. Nixdorf claimed the state-run monopoly "would certainly change their structure if they thought it would make them rich."

Nixdorf's attack on the domestic PTT included the charge that the groundwork for an integrated services digital network system here will not be ready by the year 2000.

Nixdorf also hurled criticism at the government

in general. "Germany is the strongest European country economically but at the same time the weakest nation. Germany just does not spend enough money educating its youth," he said. Furthermore, Germany's national birth rate is on the decline, heralding more bad news for the future national work force, Nixdorf predicted.

Nixdorf dealt harshly with his competition as well, arguing the superiority of his company's product line. "We've invested in order to produce quality. You cannot count on the same from the world's largest computer company," he said, alluding to IBM.

He noted that the U.S. Department of Defense invests huge sums of money in the electronics industry, which ultimately benefits private industry. German firms, on the other hand, are largely left on their own to finance their efforts, he said.

Nixdorf listed Japan, in addition to the Fests-

gen, among the enemies of the German high-tech economy. "The Japanese have been able to bring exceptional and inexpensive products to the market because of their low wage scale... a scale that would be considered unacceptable in Germany."

As for product strategy, "the future of Nixdorf AG lies in communications technology," Nixdorf said. He noted that the business of integrating data processing and data transmission accounted for 5% of the company's worldwide revenue of \$1.09 billion in 1984 and predicted it will increase to 10% this year.

But the most important contribution of the computer company is the jobs it provides. Approximately 250 workers per month were added to the Nixdorf work force in 1984, and the company has shown continued growth so far. Nixdorf predicted that corporate revenue will double that of 1984 in less than four years.

Lotus to buy Dataspeed for \$6.5 million

CAMBRIDGE, Mass. — Lotus Development Corp. recently announced it had agreed to acquire San Mateo, Calif.-based Dataspeed, Inc. in a transaction valued at \$6.5 million.

Lotus also recently announced first-quarter profits of \$6.6 million, or 58 cents per share, up from \$7.5 million, or 47 cents per share, a year earlier. Revenue for the quarter was \$44.7 million, up from \$42 million a year earlier, but below the levels of the previous two quarters.

Dataspeed manufactures two products that receive data transmissions from FM stacked radio waves and provide users with real-time stock quotations. The Quotrek product is a hand-held device that resembles a pocket calculator and displays information on a small screen. The Modio is a modem-like device that attaches to a micro and will reportedly be bridged to Lotus' 1-2-3 and Symphony software products.

The letter of intent, signed by the two companies, provides for a cash acquisition reflecting \$2.66 for each Dataspeed share before accommodating a pro rata reduction of certain shareholder expenses associated with the acquisition.

Additionally, the agreement provides for conversion of about \$3.7 million of Dataspeed's long-term debt to be converted into common stock at a conversion price of \$5 per share. Also, Lotus will acquire about \$300,000 of the long-term debt for approximately \$122,000, and all interest on Dataspeed's debt will be forgiven, according to Lotus.

Dataspeed's current cash needs will be met by loans from Lotus to provide working capital until the acquisition is formally completed, which is expected to occur within three months, the companies said.

Following approval of the boards of directors of both companies and the shareholders of Dataspeed, the acquired company will operate under the Dataspeed name as a wholly owned subsidiary of Lotus. Dataspeed's chairman, David B. Lockton, and president and chief operating officer, James West, will continue to manage the company.

SAMNA EXPLODES MORE MYTHS

"PC'S JUST CAN'T MATCH THE POWER OF DEDICATED WORD PROCESSORS"



This myth is well grounded in fact. Because before SAMNA, it was true. But SAMNA Office Automation software can make a microcomputer outperform even the most advanced dedicated word processors in power, functionality, and user interface.

SAMNA delivers high-powered word processing features like screen-to-paper fidelity, with on-screen display of special formats. Split screen editing. Easy addition, deletion, and movement of text. Automatic merging of names and addresses into form letters. Automatic pagination and footnoting. Indexing and Table of Contents generation. Glossary of standard paragraphs with automatic insertion. Automatic search and replacement. On-line generation. Automatic spell checking and correction. Electronic field to use both sides of a wide page at the same time. Zoom that shows the layout of a huge page on your screen. Three levels of help that guide you through every command. Extensive documentation and support. And much more.

SAMNA also offers the Sensation Integration™ of other functions for your other business needs. So it doesn't just match the performance of these old standards.

SAMNA blows them all away.

PC WORD PROCESSORS SOFTWARE DON'T JUST BLOWN FOR ME.



Until recently, PC word processing didn't run at hare-racing speed.

But SAMNA's Turbo-powered software is fast enough for even the most demanding word processing users. One demonstration will prove it to you. Very quickly.

Buy 10 floppies
worrying



es and stop about dust storms, lint attacks, or the bends.

The Flip 'n' FileTM 715 is an island of calm and order in the savage environment of the modern office.

It's also free, when you buy a specially marked package of 10 double or single sided, double density 3M diskettes. They're the certified 100% error-free diskettes;

no floppies are more reliable.

With this kind of protection, all you have to worry about now is when this limited special offer sells out.



Offer available from participating distributors, personal computer dealers and office supply dealers.

Which, if you don't hurry, could be before the next major coffee spill.

One less thing to worry about.

3M

COMPUTER INDUSTRY

IBM must make changes to retain its 'colossus' status



OUTLINE LINES
Don Jeffrey

First of a two-part series.

The trouble with IBM is that as soon as everyone has figured out how it works, it starts working differently.

In the 1970s, IBM was considered something of a monolith, preoccupied with its mainframes and nose too high in addressing other markets. Then in 1981 it reorganized, new strategies were introduced, diversification programs launched and a new "entrepreneurial" spirit manifested.

The success of IBM in the microcomputer marketplace was based on an indication of a new, flexible, fast-moving IBM. In 1983, *Time* ran a cover story about the company — "IBM: The Colossus That Works" — and IBM landed in an almost universally favorable response from the press, industry analysts and the financial community.

IBM announced that it was shooting for 15% annual revenue growth for the next decade and team. To be making it. In 1983 it logged 16.9% revenue growth. That same year, IBM appointed a relatively young company veteran, John Akers, as president.

It is 1985, and a lot has changed. Although most of the industry has not yet realized it, IBM has embarked on number of its radical shifts in direction. By the time it is over, it will likely have an impact on the information processing industry equal to that of the 1981 reorganization.

The most visible change has been in IBM's microcomputer operations, once the showpiece of the "new IBM." IBM's Entry Systems Division has been cut back to the status of just another IBM product division, with its marketing operations turned over to a mainstream IBM division and its charismatic head, Phillip D. Estridge, removed from the scene. The PCjr is dead, and the breakthrough 1984 growth in sales of Personal Computers has given way to what, by IBM's own admission, is going to be a much weaker 1985 market.

While opinions differ on the significance of IBM's treatment of its Personal Computer operations, there is general agreement that there will be more central control of Personal Computers and closer integration

with other IBM products and strategies.

The tone of IBM corporate management has also changed. In 1983, then IBM Chairman and Chief Executive Officer John Opel was emphasizing "new entrepreneurial opportunities with high, long-term growth potential." Opening 1985, IBM CEO and President John Akers gave an interview to *Business Week* in which he talked about IBM's Systems Network Architecture (SNA) and increasing IBM software revenue.

While all this was going on, yet another major change was occurring, one that was clearly not in the company's plans. IBM's financial performance took a nosedive. After its 1983 peak, IBM's revenue growth hovered a little above 10% for the first three quarters of 1985, then dropped to 12.4% in the fourth quarter. In the first quarter of 1986, things went from bad to worse. Revenue growth was down to a startling 1.9%, and earnings dropped no less than 17.6%. IBM blamed the slump primarily on the exchange rate.

The exchange rate didn't help, but the fact is that John Akers had taken over management of a company that had not seen serious problems, and the decisions being taken under his regime were attempts to deal with a fast-deteriorating situation.

What went wrong? Among other things were the following:

• IBM had given itself a major short-term growth stimulus by converting from a rental to a sales company, substituting larger up-front billings for the slower, more stable revenue streams from rental equipment. Rental income declined from 44% of IBM revenue in 1979 to 37.3% in 1981 and 14.3% in 1984 and seems to be disappearing in 1985.

The problem is that IBM has now pretty well exhausted the growth potential from the conversion process. In retrospect, IBM had converted too fast, giving it several years of fast growth but creating a serious growth drag over 1984-85 as the stimulus slowed.

• Despite the widespread perception of IBM as the "Colossus That Works," IBM over 1981-84 had been a company of highly variable performance.

A couple of "star" performers, principally mainframes and Personal

Computers, had disengaged weaker showing elsewhere. The mid-range sector has remained weak; virtually all of IBM's Independent Business Units turned in weak performance; maintenance services, which have accounted for more than 11% of IBM's revenue for several years now, remained a high overhead operation that had to strain to match corporate growth; IBM's move into the telecommunications area into technical bugs, problems with collaborators and losses; the company's massive investments in R&D and manufacturing plant and equipment did not pay off as expected.

As a result, IBM became highly dependent on its "star" performers. They were carrying much of the rest of the company. In 1984, IBM recorded record sales of its 3000 line of mainframes and related products, and its Personal Computers. Shipping 1080 and Personal Computer sales this year have had a "multiplier effect" in bringing down overall corporate performance, and the slowdown in IBM's revenue growth from these areas looks like a long-term phenomenon.

John Opel's decentralized management style has resulted in IBM's failing to address many structural problems. For example, the profusion of Personal Computers in the market has had an adverse effect on IBM's efforts to develop a more comprehensive office automation scenario built around PSA.

The decentralized management style also means that IBM failed to address the inefficiencies and losses of its Independent Business Units, the National Marketing Division, small business direct sales organization and the discontinued Product Center program and other areas. Similarly, although IBM had been drawing plans for its heavy R&D and manufacturing investments, there is reason to doubt their effectiveness. IBM's in-house R&D activities have contributed only a few really new products and technologies, and shoveling robots at its work force has disguised the fact that IBM remains overstaffed on the manufacturing side. In both cases, IBM's response has been to throw money at the problem rather than to perform the kind of surgery that could have made these areas more cost-effective.

Next week: What the changes are likely to involve.

Jeffrey is director of research at International Technology Group, a Palo Alto, Calif.-based computer industry market research firm that focuses on IBM.

Reach over 60,000 French computer professionals.



Advertiser in CW Communications' French publications and sell your products directly to the leading French computer market. According to International Data Corporation (IDC), the world's leading information industry research firm, France is the second largest market in Western Europe with CP expenditures for 1984 at more than \$14.4 billion (U.S.) and a projected growth to over \$30 billion (U.S.) by 1989. Our publications can help you reach all segments of the computer industry in France.

Each week 26,000 M&E/CW executives read *Le Monde Informatique* to keep abreast of the latest developments in the industry. Each month CFC (CFC World France) reaches over 15,000 IBM PC users and potential buyers who are looking for the latest information on the IBM PC and compatible products.

Distributors to send each month by 5,000 computer distributors and visiting professionals. The editorial focuses on the short-term market.

26,000 Apple computer users turn to *Golden magazine* each month for the latest information on Apple and Apple compatible computer products.

CW International Marketing Service makes advertising your products in France, and around the world, easy. We have over 30 publications in more than 25 countries. For more information on our wide range of services, complete the coupon below and mail today.



Steve La Monte
General Manager
CW International Marketing Service
70 Cambridge Road, New York
Hingham, MA 02043

- Please send me more information on:
- ☐ *Le Monde Informatique*
 - ☐ CFC World France
 - ☐ Distributor
 - ☐ Golden
 - ☐ Your other foreign publications

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____

Former IBM exec joins Amdahl

SUNNYVALE, Calif. — Amdahl Corp. has named former IBM Corporate Marketing Director R. Joseph Zemke chief operating officer, effective May 1.

Zemke most recently was president and chief executive officer of Auto-Trol Technology Corp. in Denver. Before joining Auto-Trol, he was employed by IBM for 18 years as a

systems engineer, regional manager and corporate director of marketing. Zemke will be part of Amdahl's newly formed office of the president. He will report to Amdahl Chief Executive Officer John C. Long.

Zemke will be responsible for direct management of the day-to-day functions of the mainframe and storage product manufacturing.



**Now, Zenith Data Systems
Introduces An Entire Line
Of Terminals Complete With
FCC Class B Approval And
Free 90-Day On-Site Service.***

Please send me the FREE Zenith Product Information Kit(s) I have requested below. I understand that a Zenith Data Systems representative will contact me shortly after I receive my Kit(s), but that I am under no obligation to purchase. Or, call Toll Free 1-800-842-9600, Ext. 1.

Name (Please Print) _____ Title _____

Business Name _____

Business Address _____

City _____ State _____ Zip Code _____

Your Signature _____

*90-day warranty in the United States. Please allow two to three weeks for delivery.

Please check if you are interested in:

- ☐ Zenith General Purpose
ASCII Terminals
☐ Zenith DEC-Compatible
ASCII Terminals
☐ Zenith 2,000 PCs and
Monitors

Please check if you are:

- ☐ An End User
☐ An O.E.M./V.A.R.
☐ A Dealer

zenith data systems
We Service You - In Style - At Your Cost - 100%

CW



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 87 MT. PROSPECT, IL

POSTAGE WILL BE PAID BY ADDRESSEE

TEMTECH | data
systems

P.O. Box 7618
Mount Prospect, IL 60056



THE ZENITH

ZENITH audio
systems

**Software AG Users
spell it out...Datapro™ survey
rates ADABAS**

E-X-C-E-L-L



**ADARAS does it again—
and we're not surprised!**

The results are in! Datapro Research Corporation asked systems software users to rate their data base management systems. And, Software AG users rated ADARAS "Excellent!"

Exactly the same thing happened in an earlier survey when Data Decisions asked users what they thought. For the third year in a row, ADARAS went right to the top of the list as the highest ranked DBMS for the IBM mainframe. And NATURAL was a top contender for best fourth-generation language.

Together, ADARAS and NATURAL make an unbeatable team!

At Software AG we don't believe in surprises. We believe in providing our users with the most powerful software tools available anywhere. And that's the proper plan for the world leader in advanced systems software.

So, if you want the facts about systems software, just ask our users. For starters, send us the coupon below and we'll rush you the official Datapro DBMS report. Or call us at 1-800-336-3761. (In Virginia and Canada, call 1-703-860-5050.)

Rush me the facts.

Name _____
Title _____
Company _____ Zip _____
Address _____ State _____
City _____

Complete and mail to: Software AG
19500 Green Valley Drive, Boston, VA
22061. Or call 1-800-336-3761. In
Virginia and Canada, call
1-703-860-5050.

COMPUTER INDUSTRY

Tandy advertisement prompts Victor suit

SAN FRANCISCO — Victor Technologies, Inc. has filed suit against the Radio Shack division of Tandy Corp. because of a Tandy newspaper advertisement that encouraged users of Victor and other personal computers to "throw your orphaned computer on the junk pile."

A spokesman for Victor, which is currently protected from its creditors under Chapter 11 of the Federal Bankruptcy Act, called the ad "really pretty sickening. It was particularly unfair since we've never abandoned any of our products, and we have continued to manufacture and support the 9000 [mentioned in the ad]," spokesman Michael Penna said.

The suit, filed April 23 in U.S. Dis-

trict Court here, seeks \$1 million in punitive damages and unspecified amounts in special damages and in general damages for loss of reputation. The suit demands compensation for any sales Victor can prove to have lost because of the ad and an account of any profits Tandy may have made promoting its products at the alleged expense of Victor.

The ad, which ran Feb. 22 in *The Wall Street Journal* and other publications, offered owners of Victor and other micros a \$75 to \$150 credit toward either a Tandy or a Radio Shack personal computer. "Radio Shack wants to give your orphaned computer a new home — the junk pile," the ad read.

Victor attorney Constance Jones said that Victor did receive a requested letter of apology from Tandy but that Tandy refused to publish a retraction of the ad as demanded by Victor. Jones said Tandy's letter "apologized for any offense that Victor had taken," but did not disclaim the description of the Victor computer as "orphaned."

Tandy legal department spokesman Herschel Wynn could not be reached for comment.

No other vendors mentioned in the ad have filed suit against Tandy, but Penna said Victor's action may encourage them to do so if they feel that their reputations have been damaged.

TAX from page 85

noncapital-intensive companies such as software developers — Mosley said computer service and software companies have simply qualified for fewer tax credits and incentives in the past, and, therefore, fewer tax dollars would be taken away from them under the new proposals.

Mosley said Adapco plans to study each of the tax proposals to determine whether they create adequate incentives for research and development and capital formation. Adapco's board will support tax reform only if sufficient incentives are identified, he said.

Tax credit up for review

Also slated for congressional review is the Research and Development Tax Credit, which provides a 25% credit for increasing a company's qualified research expenditures over a specified time period, said Mary Jane Desrochers, Adapco's assistant general counsel, who co-chaired the meeting with Mosley.

In 1983, the IRS attempted to redefine what constitutes qualified research, making computer software ineligible for the credit, Desrochers said.

The IRS' proposed regulations were never finalized, Desrochers said, but because the credit will expire Dec. 31, Adapco members will lobby for the passage of two bills now before Congress.

The bills (S. 55 and H.R. 1188), introduced by Sen. John Danforth (R-Mo.) and Rep. J. J. Pickle (D-Texas), respectively, would make the R&D tax credit permanent.

These bills would also redefine qualified research to include R&D specifically aimed at the development of software for business use, Desrochers said.

No hearings have been scheduled for the bills yet, she said. However, Adapco is collecting financial data from computer and other high-technology firms that will be used to support Adapco's claim that the credit is effective in stimulating increased R&D, she said.

Private Letter ruling

Another ruling slated for congressional review is the "Private Letter" ruling, issued by the IRS last fall. The ruling exposed most software companies to a personal holding company tax that could cost them a 50% tax on all retained earnings.

"The IRS ruling, in effect, lumps software companies under the personal holding company tax umbrella," Desrochers said.

Under rules governing taxation of personal holding companies, software license and maintenance fees constitute "passive" income, and if 50% of a software company's income is derived from passive investments, they may be faced with a 50% penalty tax on retained earnings, Desrochers said.

In response to the IRS ruling, Adapco has asked Rep. Ed Zschau (R-Calif.) to introduce legislation retroactive to 1963 that would exclude computer software licensing and maintenance fees from the personal holding company income category, Desrochers said.

Adapco also hopes to convince the IRS that a mechanical application of the personal holding company tax would impede the development of the nation's software industry.

No waiting!

The new compiler for dBase III

WORDTECH SYSTEMS

**Has your software
investment turned into an
unmanageable mess?**

**Peat Marwick's PATHVU™
can analyze your software,
find the problems and
report them. Then we can
fix them.**

You have a huge investment in your business software. To make that investment pay off at its maximum effectiveness you must really know how well it's functioning right now. That's why Peat Marwick developed PATHVU.

Designed specifically for IBM, COBOL Systems, PATHVU gives you a quick, precise statistical measure of your software library which you can produce as often as you need it. It identifies a variety of problems such as violations of company software standards. And tells you about them in two readable reports both technical and in lay terms for management. PATHVU helps facilitate software investment decisions now. It also helps you minimize the best possible expense in the future.

And, because we're Peat Marwick, our follow-up is superb. Once your PATHVU system is in place we will provide you with ongoing consultations to help you develop software management strategies based on facts. To help you get the most out of the software you have without costly, traumatic system replacement.

PATHVU has been proven to use by more than 100 companies, and 100 million lines of code. For more information on PATHVU, send in the coupon or call 800-344-3698 (in Illinois, call 800-328-6200).

Mail to: Peat, Marwick, Mitchell & Co.,
345 Park Avenue, Box PDC/New York, NY 10054

Name _____
Title _____
Phone () _____
Company _____
Address _____
City _____
State _____ Zip _____



**PEAT
MARWICK**

Accounting and Auditing /
Tax Services/Management Consulting/
Private Business Advisory Services

Cray revenue triples for quarter

MINNEAPOLIS — The sale of nine supercomputer systems in the first quarter allowed Cray Research, Inc. to report \$118.6 million in revenue, nearly triple the \$44.1 million posted in the first quarter of 1984.

Profits for the quarter ended March 31 were \$30.8 million, or \$2.06 per share, up from \$5.7 million, or 39 cents per share, one year ago. In the first quarter of 1984, Cray sold two systems and leased three others.

Because of the multimillion-dollar price tags of its key products, Cray's quarterly re-

sults are influenced significantly by the number of computer systems accepted during the period and by whether systems are purchased or leased.

Cray Research Chairman John A. Rollwagen said the company expects to install 30 new systems in 1985. "Though all of the systems accepted in the first quarter were purchased, we still anticipate significant leasing activity during the balance of the year, involving approximately half of the remaining systems," Rollwagen said.

CURB from page 85

board thing, like a 10% or 20% surcharge on all Japanese products, we'll get caught in it."

Like most of its competitors, National Semiconductor has been hurt hit by stockpiled customer semiconductor inventories, plummeting chip prices and the overall high-tech slowdown. "This is the worst downturn any of us in the industry can remember and the first one not

tied to a general economic slump," Sprague said.

But he predicted National Semiconductor will rebound within three to four months with a boost from its 32-bit microprocessor-based products. "The Series 53000 is a real bright ray of light in a dark sky," Sprague said. "We think we have leadership in the technology, that [Intel Corp.] is way late and [Motorola Inc.] is later than the market thinks. That's the best way out of a slump — to build proprietary products and hang others on them."

Picking in market

Sprague believes the overall semiconductor industry recovery will coincide with a pickup in the computer and electronics market later this year. "Obviously we won't pick up in a vacuum, but eventually, our customers are going to chew through their inventories," he said. "The business hasn't gone away; it's simply an inventory problem. I know one company that bought \$30 million worth of 64K chips at \$6 each. Recently, I've heard of the same things selling for \$8 cents."

Sprague also based his optimism on automobiles and other products currently in the design stage that will require much microprocessor-based technology than previous models.

NAS recently unveiled the 386/286 series in the IBM 3090 series Sierra, and Sprague had harsh criticism for Big Blue's market promises on another product, the discontinued PCjr microcomputer.

PCjr only 1% of IBM sales

"You guys in the press were led to, everyone was led to," Sprague said. "If any other company was touting a product like that right before pulling the plug on it, the [Securities and Exchange Commission] would be all over them. But IBM got away with it because the PCjr amounted to less than 1% of [its] business."

"IBM depends on what I call the 'FUD factor' — fear, uncertainty and doubt," he continued. "It's a big enough elephant to keep the marketplace in chaos when it wants to."

Sprague downplayed AT&T's recent entry into the 32-bit microprocessor sweepstakes and its intent to purchase four Honeywell, Inc. Synthesis chip factories. "Being a monopoly for so long doesn't train you for competition," he said. "And I challenge anyone to name a more competitive business than semiconductors. If they don't succeed, it's no big deal to their overall business, but if we don't figure out the semiconductor market, we're dead. And the threat of death helps keep people focused."

We've been accused of breaking the speed limit.

SPEED LIMIT



You Be The Judge.



Until now, if you wanted true letter quality printing, you needed a daisy-wheel printer. Then you waited and waited while it plodded along at speeds of about 55 cps.

Now the waiting is over. Because the Genicom 3520 daisy-wheel printer offers true letter quality printing at an incredible 180 cps. It's the fastest impact letter quality printer available.

And the Genicom 3520 offers full graphics capability. Impossible with a daisy-wheel.

It also features up to 300 cps data processing, high throughput, heavy duty cycle printing, quiet operation, and Hex dump diagnostics.

Plus the 3520 comes standard with Diablo® 630 and IBM® PC graphics

protocols and works with most major PC software packages such as Lotus®, Wordstar 2000® and Multimate®.

Call our Toll Free number for all the evidence. You'll find Genicom has five other 3520 models for everything from color printing and bar codes to speeds up to 400 cps.



GENICOM

The Printers That Mean Business.

TOLL FREE: 1-800-437-7668

Genicom Corporation, One, 3511, Westborough, MA 01581. In Virginia, call 1-703-946-1170.

Diablo is a registered trademark of International Business Machines Corporation. IBM is a registered trademark of International Business Machines Corporation.

Wordstar 2000 is a registered trademark of Software International Corporation. Multimate is a registered trademark of Lotus International Corporation.

See Us At
Comdex/Spring
Booth #3124

Compaq posts 42% profit rise

HOUSTON — Compaq Computer Corp. recently announced that its first-quarter profits rose 42% to \$4.6 million, or 17 cents per share, compared with \$3.3 million or 12 cents per share, one year ago.

The most successful unit of 1984—responsible desktop microcomputers—reported revenue of \$67 million for the quarter ended March 31, up 54% from \$62.9 million in the year-earlier quarter.

"Our first-quarter results are especially gratifying when compared with the mixed results of other personal computer companies during this period," Compaq President and Chief Executive Officer Rod Canine said.

Canine said sales of the company's four Deskpro personal computer models increased steadily each month during the quarter. The company claimed that the Deskpro is now the second-best-selling line of desktop business micros, trailing the IBM Personal Computer line.

Personal computers debut

The company also recently introduced the Telecompaq series of personal computers. The series is said to combine telecommunications capabilities in a desktop micro.

The Telecompaq is a product of the company's Dallas-based Compaq Telecommunications Corp. subsidiary.

Compaq recently completed construction on the first of its three-building Computer Center, its new corporate headquarters in northwest Houston.

DG from page 85

and service from a single vendor is greater than ever before."

De Castro called the reported decline in the personal computer market a myth and expressed confidence that sales of the costly received Data General/One would pick up. "The complaints about the [Data General/One] 11.20 screen are behind us," he said. "Overall, our personal computer business has held up well, and desktop model sales are up 50% this year."

Last week, DG announced across-the-board price cuts on the Data General/One. The price for the most commonly sold configuration was slashed by \$400, or 15%, to \$3,400.

De Castro predicted DG would require 30% to 35% growth in 1986 to post a 15% or 15% profit margin next year. He said achieving such growth depends largely on the overall economy, even though the company has high hopes for the products it plans to announce in the next six months. "If people aren't buying anything, products won't make a difference," he said.

De Castro included on the Data General/One user list Colorado Gov. Richard Lamm, Lotus Development Corp. Chairman Mitchell Kapor and Apple Computer, Inc. co-founder Steven Wozniak.

TAKEOVER from page 85

interests of the shareholders."

Ray Rasmann, executive assistant to the president at Sterling, said confidential discussions have been ongoing for several weeks between officers of the two companies and that Sterling is hopeful the talks will continue.

According to Rasmann, Sterling does not foresee any problem with a loss of managerial goodwill at Informatics if the takeover is successful because, he said, "even a fallout of Informatics' executives would not diminish the long-term benefits we'd gain from Informatics' products and markets. The business will remain viable."

Informatics posted a 1984 revenue of \$191 million and profits of \$6.3 million. Last week, Informatics reported that first-quarter profits were \$48,000, or 1 cent per share, down from year-earlier profits of \$889,000, or 12 cents per share; revenue increased to \$48.9 million from \$44 million a year earlier. Sterling in 1984 posted a revenue of \$18.7 million with profits of \$1.1 million.

Curt A. Mensch, a vice-president at Pulse Webber, Inc. who observes software companies, said Informatics is ripe for a takeover because of its disintegrated opera-

tions, unpopularity management team and cash-rich position. According to Mensch, Informatics is a \$250 million company with approximately 650 million in cash assets and a \$75 million debt. Sterling's offer of more than \$130 million actually reflects a real-cash bid of \$20 million for the company, which Mensch called attractive.

During a recent meeting of software and services companies, John Collamore, chairman and CEO of Collamore Software, Inc. said of the Informatics battle, "I can't believe this is happening in the software industry; it's a first." Collamore said he did not think the takeover attempt, if successful, would add any technical or business value to Informatics.

Informatics last Monday responded to the takeover threat with a lawsuit seeking to block Sterling from proceeding with the proxy battle, amping additional Informatics stock or from voting the shares it already holds. Informatics alleged that Wyly offered former personal documents, including suppressed employment for 10 years, in exchange for Buser endorsing the takeover attempt. Informatics also claimed Sterling's proxy battle was based on confidential information provided by Informatics during negotiations.

The new Canon TX-50 desktop computer.

It fits any customer's business as well as his desk

The carrier on the right is the Telecopier 295, a new high-speed facsimile just introduced by Xerox.

While it's not quite as flashy as the Concorde on the left, the technology is just as amazing.

Imagine a small, desktop

digital facsimile that can transmit high resolution copies of your documents anywhere in the world in little more than the time it takes to fasten your seat belt.

But the Telecopier 295 is not only quick, it's less expensive to

operate (with facsimile, faster is cheaper) and perfect for medium to high volume operations.

It's compatible with just about everything: the Xerox Telecopier family, most other facsimile terminals, and with the personal computer world as well, including

New York
to Paris.
3 hours,
45 minutes.



the computers and workstations that are part of Team Xerox.

With the GIG2 analog compatibility option, it can communicate with other slower speed facsimile terminals. With the RS-232-C

option, it can also convert and print ASCII encoded information from a vast array of computers.

But the most amazing thing about the Telecopier 295 is its price: about the cost of one round

trip to Paris on the Concorde.

Now that's progress.

To learn more about the

Telecopier 295, call 1-800-

833-2323, ext. 44, or

send your business card to

Xerox Corporation, Dept. 44013,

P.O. Box 24, Rochester, N.Y. 14692.

New York
to Paris
in seconds

WE JUST TOPPED THE LONGEST RUNNING LINE OF PRINTERS.

The new 5300 family of printers from Teletype Corporation represents an exceptional value. The entire family combines our traditional reliability with a 200 cps speed that is ideal for business applications. You can choose a keyboard or auxiliary printer, both of which are available in 15-inch tabletop and 9½-inch compact sizes.

From the moment you take a 5300 out of the box and plug it into your system, you'll be amazed at how easy it is to operate. To begin with, you can downline load or simply push a button on the printer's control panel to set options. And just push another button to select an alternate option set for a different system. A 4-character LCD on the control panel provides all of the status indicators you need.

The 5300 is available with a built-in 300/1200 baud modem that saves desk space and makes it possible to perform all dialing and logon functions. So you can access a CPU or timesharing network by simply depressing a key on the detached keyboard.

For printing versatility, the 5300 is hard to beat. It features graphics capabilities as well as emphasized, expanded and compressed printing.

You'll also appreciate the forms handling of the 5300. It is available with adjustable push or pull tractors, a roll paper holder, a supply rack and an accumulator.

Other features that make the 5300 an even better value include an interchangeable platen, acoustic adapter, a carrying case for the 9½-inch model and self-diagnostic capabilities.

So if you'd like a printer that tops what you have now, check out the latest in our long-running line. Write Teletype Corporation, 5555 Touhy Avenue, Dept. 3223-F, Skokie, IL 60077. Or call 1-800-323-1223, Extension 701.

**TELETYPE:
VALUE SETS US APART.**

"Teletype" is a registered trademark and service mark of Teletype Corporation.



AT&T
Teletype Corporation

CONCLUSIONS AND RECOMMENDATIONS

FORSTEN, ANDREW

GENERAL ANALYSIS

SYSTEM AND METHODS

POSTHUMOUS AWARD OF MERIT

CIVILIAN COLLECTION

1. **THE**
 2. **THE**
 3. **THE**
 4. **THE**
 5. **THE**
 6. **THE**
 7. **THE**
 8. **THE**
 9. **THE**
 10. **THE**
 11. **THE**
 12. **THE**
 13. **THE**
 14. **THE**
 15. **THE**
 16. **THE**
 17. **THE**
 18. **THE**
 19. **THE**
 20. **THE**
 21. **THE**
 22. **THE**
 23. **THE**
 24. **THE**
 25. **THE**
 26. **THE**
 27. **THE**
 28. **THE**
 29. **THE**
 30. **THE**
 31. **THE**
 32. **THE**
 33. **THE**
 34. **THE**
 35. **THE**
 36. **THE**
 37. **THE**
 38. **THE**
 39. **THE**
 40. **THE**
 41. **THE**
 42. **THE**
 43. **THE**
 44. **THE**
 45. **THE**
 46. **THE**
 47. **THE**
 48. **THE**
 49. **THE**
 50. **THE**
 51. **THE**
 52. **THE**
 53. **THE**
 54. **THE**
 55. **THE**
 56. **THE**
 57. **THE**
 58. **THE**
 59. **THE**
 60. **THE**
 61. **THE**
 62. **THE**
 63. **THE**
 64. **THE**
 65. **THE**
 66. **THE**
 67. **THE**
 68. **THE**
 69. **THE**
 70. **THE**
 71. **THE**
 72. **THE**
 73. **THE**
 74. **THE**
 75. **THE**
 76. **THE**
 77. **THE**
 78. **THE**
 79. **THE**
 80. **THE**
 81. **THE**
 82. **THE**
 83. **THE**
 84. **THE**
 85. **THE**
 86. **THE**
 87. **THE**
 88. **THE**
 89. **THE**
 90. **THE**
 91. **THE**
 92. **THE**
 93. **THE**
 94. **THE**
 95. **THE**
 96. **THE**
 97. **THE**
 98. **THE**
 99. **THE**
 100. **THE**

COMPUTER LITERACY

...the ...

with no landing experience.

...the ... of the ...

RESEARCH

Department of the Environment
Computer Laboratory

is also available in highly decorative, textured finishes. The available color palette includes traditional neutrals, as well as vibrant, rich colors.

SPRING COLLEGE IS AN EQUAL OPPORTUNITY AFFIRMATIVE ACTION EMPLOYER.

ADVANCE YOUR CAREER

Great Companies in the Southwest, CIO, and the other major employment organizations are all working with the Environmental Protection Agency. If you are considering a move, you need to research the company first. There's a lot of information out there.

to either:

Applications	
Accounting/MS/Excel	\$299
CRM, Mktg.	\$379
ERP, HR	\$399
CRM, CR, CO, CO	\$399
CRM, Banking	\$399
CRM, HR	\$399
CRM, CRM, CRM/MS/Excel	\$399
Tech Support/Internals	
MS/Excel or VBA	\$479
MS/Excel	\$499
CRM	\$499

DRA's, IRS _____ in \$440

ADVANCED RECRUITERS
P. O. Box 17489
JACKSONVILLE,
FL 32214-0489



LIFE OF VIRGINIA

**PROGRAMMER/
PROGRAMMER ANALYSTS
LIFE COMM/LIFE 76/MARK IV**

New Activity In Product Development

partners with LIFE COMB, LIFE 70.

By MARY JOHNSON. CHARGE as possible helped.

We offer competitive salaries, comprehensive benefits, and career opportunities in a dynamic MNC environment dedicated to customers.

Please forward resume with salary requirements to:

David P. Johnson
Human Resources
Life of Virginia
One East Broad Street
Richmond, VA 23219

**ENGINEERS
PROGRAMMERS/
ANALYSTS**

Seeking individuals whose professional interests include:

Telecommunications, Artificial Intelligence, Gov't of Computers, Processors, Data Bases, Graphics

Systems, Networks, CAD/CAM, Simulation, Modeling

J. ROGERS ASSOC
NJ (201) 595-0101
out of state 800-525-0100
128 Poplar Center Rd-Suite C-E
Lansdale, NJ 07631

1. **المادة 1**
 2. **المادة 2**
 3. **المادة 3**
 4. **المادة 4**
 5. **المادة 5**
 6. **المادة 6**
 7. **المادة 7**
 8. **المادة 8**
 9. **المادة 9**
 10. **المادة 10**
 11. **المادة 11**
 12. **المادة 12**
 13. **المادة 13**
 14. **المادة 14**
 15. **المادة 15**
 16. **المادة 16**
 17. **المادة 17**
 18. **المادة 18**
 19. **المادة 19**
 20. **المادة 20**
 21. **المادة 21**
 22. **المادة 22**
 23. **المادة 23**
 24. **المادة 24**
 25. **المادة 25**
 26. **المادة 26**
 27. **المادة 27**
 28. **المادة 28**
 29. **المادة 29**
 30. **المادة 30**
 31. **المادة 31**
 32. **المادة 32**
 33. **المادة 33**
 34. **المادة 34**
 35. **المادة 35**
 36. **المادة 36**
 37. **المادة 37**
 38. **المادة 38**
 39. **المادة 39**
 40. **المادة 40**
 41. **المادة 41**
 42. **المادة 42**
 43. **المادة 43**
 44. **المادة 44**
 45. **المادة 45**
 46. **المادة 46**
 47. **المادة 47**
 48. **المادة 48**
 49. **المادة 49**
 50. **المادة 50**
 51. **المادة 51**
 52. **المادة 52**
 53. **المادة 53**
 54. **المادة 54**
 55. **المادة 55**
 56. **المادة 56**
 57. **المادة 57**
 58. **المادة 58**
 59. **المادة 59**
 60. **المادة 60**
 61. **المادة 61**
 62. **المادة 62**
 63. **المادة 63**
 64. **المادة 64**
 65. **المادة 65**
 66. **المادة 66**
 67. **المادة 67**
 68. **المادة 68**
 69. **المادة 69**
 70. **المادة 70**
 71. **المادة 71**
 72. **المادة 72**
 73. **المادة 73**
 74. **المادة 74**
 75. **المادة 75**
 76. **المادة 76**
 77. **المادة 77**
 78. **المادة 78**
 79. **المادة 79**
 80. **المادة 80**
 81. **المادة 81**
 82. **المادة 82**
 83. **المادة 83**
 84. **المادة 84**
 85. **المادة 85**
 86. **المادة 86**
 87. **المادة 87**
 88. **المادة 88**
 89. **المادة 89**
 90. **المادة 90**
 91. **المادة 91**
 92. **المادة 92**
 93. **المادة 93**
 94. **المادة 94**
 95. **المادة 95**
 96. **المادة 96**
 97. **المادة 97**
 98. **المادة 98**
 99. **المادة 99**
 100. **المادة 100**

Job dissatisfaction, complacency, and frustration are the biggest obstacles to overcome to achieve one's career goals. Everything new starts opportunities open up by

Because we are unaware of their existence, let us hope you showed up

what your true value is in the market place. Absolutely no obligation. Please call or write Keith Ruchka, CPC, Data Processing Specialist.

Dunhill

OF CHARLOTTE, INC.
6401 Central Road, Suite 100
Charlotte, North Carolina 28205
800-455-5932
(NC Only) (704) 546-8942

CONSUMERS
\$30,000 to \$60,000
Aggressive sales strategy

Long and Short
.TA
 NON-STOP, PATHWAY, D
.UN

Custom Blends, National

**TECHNICAL
RESOURCE
GROUP**

TANTS

RAY, ENFORM, TDP, TRL
40.

MOR, DENNIS, PASCAL

WDC.
Oligon, COSOL, PL/I
IBM/IDEAL.
T, VOLLIE; Meta COSOL
r sand reams
63 Poplar Ave.
Rm 300
Memphis, TN 38119

PORTION ANNOUNCEMENTS

PORTION ANNOUNCEMENTS

PORTION ANNOUNCEMENTS

PORTION ANNOUNCEMENTS

PORTION ANNOUNCEMENTS

We're looking for a frustrated IDMS Data Base Administrator!

We're looking for the person who recognizes the power of IDMS as a software tool but is in an organization slow to utilize that power.

We are fully committed to IDMS. We have the latest in software — in fact, we were a Beta test site for IDMS Release 16.0.

Major new developments are underway and we need your IDMS expertise to support project teams in data base design.

Not only do we have full commitment to IDMS, we are also fully committed to training. Most importantly, our team environment affords the opportunity to apply your knowledge.

If, in your ready for a positive change, let us know.

Please send your resume and salary requirements to the Employee Relations Department. Principals only.



Central and South West Corporation

P.O. Box 22084 • Dallas, Texas 75222

Central and South West Corporation is one of the nation's leading electric utility systems, having annual revenues of more than \$8 billion. With corporate headquarters in Dallas, C&SW serves more than four million people through its operating companies in Texas, Oklahoma, Arkansas and Louisiana.

Equal Opportunity Employer

The Mind to Imagine THE SKILL TO DO

Motorola's Government Electronics Group — a world leader in electronics, renowned for quality and productivity through employee participation in management — has the following opportunities for data processing professionals.

TECHNICAL PROGRAMMER/ANALYSTS

Our Radar Operations Quality Assurance function area is seeking an experienced software systems design professional. Requires experience with mainframe and PC applications with knowledge of quality engineering techniques and data reduction methods. Prefer BSCS with 5 years of needed Fortran programming experience on HP 1000 in a QA environment.

Join the professionals of Motorola's Government Electronics Group. Qualified applicants are invited to send resume or call Jerry Chadwick collect at (802) 949-3769.



MOTOROLA INC.

Government Electronics Group

2301 E. McDowell Rd., Dept. B344
Scottsdale, AZ 85262

An Equal Opportunity/Affirmative Action Employer
U.S. Citizenship Required

TRAINING SPECIALISTS

Were you a part of a team that developed the most outstanding management program for computer operators? Perhaps you have been a part of a team that developed a new training program for new operators.

Utilizing your excellent presentation, training, development and instructional skills, you will teach students which are offered by this company in the Boston, New York and Richmond areas.

The successful candidate must have a minimum of three years previous experience in training computer operators plus strong written and oral communication skills. Appropriate degree or diploma in business, education, or communications with experience in training computer operators will be considered.

Interested? Send your resume and a full range of benefits. An initial interview will be held at the location. We have space in Fitchburg for the summer of 1985.

Please submit complete resume and letter of introduction to:

INDUSTRIAL, INC.
100 Boston Street
Boston, MA 02118
(617) 540-0977

TEXAS

Troubleshooters

Leading Texas based IBM third party maintenance company is seeking qualified Customer Engineers to maintain IBM systems 34/36/38 and peripherals in Dallas, Ft. Worth, Houston and Austin. Call Pat Fultz, Executive Vice President, collect at (713) 939-8800.

MOVE AHEAD WITH COMPUTERWORLD

More computer people read Computerworld than any other newspaper in the United States — more than half a million computer people every week.

And, getting our readers at our organizations, about half claim to look at recruitment ads at least every other week (only a small percentage say they never look at recruitment ads).

No wonder Computerworld carries more recruitment ads for computer people than any other publication.

To place your ad or to get a rate card with complete details on Computerworld's Classified section, call or write:

Classified Advertising
Computerworld
375 Southside Road,
Box 600
Parsippany, NJ 07054

1-800-345-6774
617-678-6788

Telephone extensions
220-690-0000
617-678-6788

PORTION ANNOUNCEMENTS

NEW ENGLAND

BOSTON

IBM DBA
Perhaps 800 firm needs pro-grammer to provide tech leadership. Extensive, in-depth CPU IBM 3090/3080/3081. Opportunity to participate in IBM DBA. Salary commensurate with experience. \$45,000.

BOSTON

VAX NETWORK PLANNER
Leading IT firm needs immediate top-tier tech contributor to direct VAX network planning of VAX/VMS. Perhaps capacity planning, network planning, provided a variety of user computing techniques. Outstanding opportunity/compensation \$55,000.

BOSTON

EDP AUDITOR
One of 3-1/2 leading firm needs, three years technical tech experience to expand its audit staff. Knowledge of IBM/COBOL, and/or report writing, database, and/or report writing. Any solid IBM exp. or report writing. \$40,000.

HARTFORD

T.P. CORP. ANALYST
Telephone switching, P&C, voice comm, a large consulting firm for test equipment. Client: manufacturing corporations, facilities, design, evaluation, selection, costing, in-solution. Pleasant offering growth with salary to \$40,000.

HARTFORD

DATA BASE
Client needs immediate top-tier for IBM and/or VMS exp. analysts to install new on-line bus sys. into 3-1/2 year. Qualities for job, exp. in 320-450,000 range. Please: experience only.

PROVIDENCE

SYSTEMS ANALYST
Dir. of Fortune 100 Co. seeks a sys. analyst weekly sys. analyst. 3-1/2 year exp. desired. 4 month retention exp. P&C, leadership, training, sys. programming exp. \$32,000.

ROBERT HALF

EDP PERSONNEL SPECIALISTS

Select the Manager of any office listed below.

100 Summer St., Boston, MA 02110
(617) 435-1300

111 Pearl St., Hartford, CT 06103
(203) 278-7170

300 Tenth Street, Providence, RI 02903
(401) 276-8790

Client Companies Associate All Firms.

Project Managers

FIRST IN HOGAN Implementation in Financial Leadership in Data Processing Careers

FIRST CHICAGO

The First National Bank of Chicago, one of the nation's most experienced financial institutions, is a recognized leader in successful implementation of HOGAN systems.

Our recent C&S conversion is now complete and we're ready to begin a new phase, creating several key project management opportunities in our Chicago headquarters. These positions will provide leadership in our team of data processing professionals and users involved in the conversion of C&S, Savings, CD and IRA products, as well as implementation of a HOGAN C&S based system and other related.

Requires 7 or more years data processing experience, including 2 or more years project management and supervisory experience; 3-5 years HOGAN total experience is desirable.

Join the #1 Team in HOGAN Implementation and enjoy the results of a financial leader. First Chicago offers an excellent salary, a comprehensive benefits package and exceptional career-building opportunities in senior management. Please respond with resume and salary history. IN STRICT CONFIDENCE to Holly Steinhilber, Executive/Professional Recruitment Unit, THE FIRST NATIONAL BANK OF CHICAGO, One First National Plaza, Chicago, IL 60601-0001. We are an equal opportunity employer m/f/h.

FIRST CHICAGO

The First National Bank of Chicago

HP PROFESSIONALS

A great first opportunity exists with our

We are actively searching for a highly motivated, experienced professional with a minimum of 5 years of experience in the field of computer systems management. The successful candidate will be responsible for the day-to-day operation of the computer system, including the installation, maintenance, and troubleshooting of hardware and software. A strong background in HP systems is a plus.

We offer an excellent salary and benefits package, a challenging work environment, and the opportunity for professional growth. If you are interested, please send your resume to:

HP Professional Services, Inc.
P.O. Box 1000
Palo Alto, CA 94303

COMPUTER DATA PROCESSING INSTRUCTOR

Instructor in programming languages, operations, microcomputers, etc. Two years of Data Processing experience and 2 years of formal D.P. education required. Teaching experience, Master's degree preferred. Salary \$24,111-\$30,276 for 1985 starting point. One of the most beautiful and progressive public community colleges. Located in the heart of the San Francisco Bay Area. San Francisco Community College, 1000 California Street, San Francisco, CA 94109. Send resume to: Mrs. Anne

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

WE NEED YOU

We need professionals to work in our MICS, product line who are knowledgeable in state-of-the-art IBM technology with experience and expertise in:

- MVS/XA or TSO
- SMP, INFOSYS and INFO/AMT
- VTAM or SNA
- ISMS, CICS, or DBI
- ISPF/PM

Why send you, if you also have a solid background in MVS installation management in any of these areas:

- Senior Technical Management
- SMF, RMF and Reliability Data Analysis
- JES5 or JES2 Analysis
- Performance Management
- Product Education and Documentation
- Systems Modeling
- Network Management
- Problem/Change Management
- Customer Service

Our atmosphere is casual, but intensely productive. Our salary, benefits, and relocation package is one of the best in the industry. Our commitment is to excellence — in software products, user support, education and staff.

If you are interested in a fast-paced, technically challenging, business driven firm, that is among the top 50 U.S. suppliers of software products and services as ranked by the JCP Software Business Review, call or send credentials to:



Machine Room
MORINO ASSOCIATES, INC.
8615 Westwood Center Dr.
Vimma, VA 22180-2215
(703) 448-8868

An Equal Opportunity Employer

COMPUTER PROFESSIONALS

Babcock & Wilcox, one of the nation's leaders in energy related technology, needs solidly experienced computer professionals to fill immediate openings at its Research and Development Division.

GROUP SUPERVISOR

Will direct the planning, cost justification, implementation and operations of the computer equipment supporting the design/manufacturing user base for the Research Center. Will also supervise the planning and implementation of voice and data communication systems. Previous computer experience and UNIX computer experience is required. A BS in Computer Science is required, and an MS is desired, along with 8-10 years of applicable work experience.

COMMUNICATIONS SYSTEMS ENGINEERS

Provide planning, analysis and support in our data communications environment, install hardware and software evaluations and recommendations for our voice and data communication systems. 3-5 years of applicable work experience, and a BS in electrical engineering or computer science is required.

VOICE AUTOMATION SPECIALIST

Plan, install, implement, and supports necessary hardware and software to provide word processing and other office automation technology at the Research Center. A BS in computer science, or a related field, along with 2-3 years of applicable work experience is required. A strong exposure to office automation packages is desired.

Salary and benefits are excellent, as is the potential for career advancement. For confidential consideration, please send resume and salary history to: James R. Cook, Employment Coordinator, Babcock & Wilcox, Attention: Research Center, 1988 Riverchase Drive, Allentown, PA 18101.

An Equal Opportunity Employer

Babcock & Wilcox
Research & Development
a technology company



BANGING HOT LINE NATIONAL REGISTRY 818-483-8444

Now we're looking for experienced professionals to join our growing team. We're looking for people who are motivated, energetic, and have a strong background in sales and marketing. If you're interested, please call us today.

MANAGER OF DATA PROCESSING

A computer industry leader seeking a Manager of Data Processing. The ideal candidate will have a minimum of 10 years experience in the field of data processing, with a strong background in system analysis, programming, and database management. The position involves the management of a team of professionals and the coordination of all data processing activities.

The position involves the management of a team of professionals and the coordination of all data processing activities. The ideal candidate will have a minimum of 10 years experience in the field of data processing, with a strong background in system analysis, programming, and database management.

PROGRAMMING ANALYST, DB/COB

Requires programming of IBM System 38 computer. Responsibilities for the successful candidate include: analysis, design, programming, testing, and documentation of COBOL and DB/COB programs. The position involves the management of a team of professionals and the coordination of all data processing activities.

COMPUTERWORLD

The Recruitment Connection...

... the best connection to have when you are looking for your computer professional. There is a good reason why COMPUTERWORLD is the number 1 computer industry trade newspaper. No other newspaper of its kind can give you the broad exposure to what you get by advertising in COMPUTERWORLD. It is read by over half a million people, most of them top-notch professionals with top-notch computer companies.

COMPUTERWORLD publishes every Monday and the deadline for receiving your advertisement is always ten days prior to the issue date desired. The open line rate is \$10.35 per line with a minimum size of 2 column inches. Send in either camera-ready material or clearly typed copy with a layout if desired. We also have a telecopier service and editors who will give you the take copy over the phone.

Our mailing address is COMPUTERWORLD Classified Advertising, 875 Columbia Road, Ste. 890, Framingham, MA 01761. Or call for more information at 1-800-343-6474 or, in Massachusetts, (617)875-0700.

X.25 Network Consultant

Temporary Assignment in Norway

Electronic Data Systems (EDS) Corporation is one of the nation's largest growing information processing companies, with offices across the U.S. and around the world. Due to our recent expansion, we have an immediate need for an X.25 Network Consultant to take on a two-year assignment in Norway.

Your duties will involve supervising the design and development of an X.25 network which will interface with IBM SNA, in replacing existing IBM/OS/VS/COBOL/VS/COBOL networks, the system will save approximately 1,000 hours each year and is expected to grow 100% per year.

The expert you seek must have experience in X.25 network planning, installation and operations, including interface of SNA and IBM VAX equipment. Hands-on experience as a network operator and data communications background/consultant is also mandatory. Other desirable background includes training and experience in IBM SNA software and various types of network planning and operations procedures.

EDS can offer you a dynamic environment for career advancement and excellent career opportunities. Due to our recent alliance with General Motors, we also offer exceptional salary and company-paid benefits packages. If you are interested in adding international experience to your background and want to take career potential, call or send your resume immediately to:

Mark B. Vukobratovic
Electronic Data Systems Corporation
Corporate Headquarters
12000 Peach Creek Drive
Suite 200, Englewood, CO 80150
Dallas, TX 75201
(214) 388-8810

EDS

Electronic Data Systems Corporation
The World's Largest Information Company

Yemen Arab Republic Technical Assistance Project General Notice

The International Development Association (IDA) has approved a Development Credit assistance project to the Central Planning Organization.

The project includes two years of services each for a Senior Adviser/Computer specialist, Technical Adviser/Computer Systems Analysts (2), Cost specialist, Contract specialist and Technical Assistance specialist.

The Project also includes overseas staff training in information resource management and systems development, project cost estimating and control, procurement documentation and practices, management of technical assistance and development planning and follow-up.

Interested agencies and individual applicants for the specialist posts, may obtain further information by writing to the Project Director, Technical Assistance Project, Central Planning Organization, P.O. Box 175, Sana'a Yemen Arab Republic; notifications of interest must be received not later than May 31, 1988. Applicants should indicate their specific areas of interest.

DL1 DATA BASE ANALYST

Outstanding WESTERN NY looking for a DL1 Data Base Analyst. We have found DL1 system files, with 3 year old DL1 files. We are looking for a DL1 Data Base Analyst. The position involves the management of a team of professionals and the coordination of all data processing activities.

Our mailing address is COMPUTERWORLD Classified Advertising, 875 Columbia Road, Ste. 890, Framingham, MA 01761. Or call for more information at 1-800-343-6474 or, in Massachusetts, (617)875-0700.

DISPATCH

DISPATCH & MANAGEMENT

SEARCH ENGINEER - SEARCHER The New York City Office of the Police Department is currently accepting applications for the position of Search Engineer. The position involves the management of a team of professionals and the coordination of all data processing activities.



Software Management Opportunities — Where Performance Counts.

SOLID STATE SYSTEMS, INC., located near Atlanta, Georgia is a successful 11 year-old design and development organization and manufacturer of computerized telephone systems and energy management systems. The 100 plus people at Solid State take great pride in past accomplishments and look eagerly toward the future.

SOLID STATE NEEDS:

SOFTWARE DEPARTMENT MANAGER with leadership capability and 3-4 years management experience at the department level. Master's degree in Computer Science, Mathematics, or comparable engineering background. Program management, experience with real-time systems, engineering and product design necessary. This dynamic, highly motivated individual must be cost and schedule conscious and able to direct departmental activities to meet corporate goals.

PROJECT MANAGER - requires BS in EE, CE or Math and 5 or more years experience in real-time microprocessor systems and assembly/higher order languages. Project management experience, documentation, communication skills and motivation necessary.

SOLID STATE OFFERS MANAGER:

- Challenges brought about by growth and change.
- Outstanding salaries to high achievers.
- New facilities in our corporate headquarters - later this year.
- Opportunity for professional achievement and recognition.
- Association with enthusiastic, innovative managers.
- Opportunity to lead and direct creative, self-starters.
- Association with experts in communications and energy management.
- Stimulating, fast paced environment.
- Software dependent systems and products.
- Comprehensive benefit programs.
- Good company, open atmosphere.
- Leading edge technology exposure.

FOR FURTHER INFORMATION concerning opportunities at Solid State Systems, Inc., please direct your resume, including current salary, in strictest confidence to: Glenn Morgan, Solid State Systems, Inc., 1000 Peachtree Industrial Blvd., Atlanta, Georgia 30309. U.S. Citizenship required. An Equal Opportunity Employer.



INTERNATIONAL O.P. ADVISORS SAUDI ARABIA

The U.S. Bureau of the Census has been providing data processing technical assistance in the developing world for more than 30 years. Currently there is a need on its overseas staff for:

SENIOR SYSTEMS ANALYSTS AND PROGRAMMER ANALYSTS

Selected applicants will be assigned to the CENSUS BUREAU's new office at the National Computer Center (NCC) in Riyadh, Saudi Arabia. The NCC is equipped with state-of-the-art equipment including an IBM 3081 (MVC) system running under CICS/ROM/VS/CP. Staff responsibilities include the design, development, programming, and documentation for a variety of applications. User interface and training are important aspects of the work.

Minimum qualifications include U.S. citizenship, at least 5 years data processing experience, with at least a year on IBM 300X systems. Arabic language capability a plus.

Assignments are for 24 months in Riyadh with R&R travel provided. Salary range is \$30K-50K plus 20% differential, 5% Sunday premium pay, and cost of living allowance. Other benefits include free furnished housing and automobile, use of PX and commissary, and education allowances for children.

Please send Standard Form 171 (Personal Qualifications Statement) or resume to:

U.S. Department of Commerce
Bureau of the Census
Personnel Division, Room 3305-A
Washington, D.C. 20543
Attention: E. Anthony

or call Martin A. McInerney
(202) 785-2600
for further information

An Equal Opportunity Employer

PROGRAMMING FOR DISCOVERY

Northrop Advanced Systems Division. Applying hands-on innovation to advanced technology.

By utilizing the latest equipment and techniques, Northrop Advanced Systems Division is advancing systems for use in the 21st century.

Our highly skilled Information Resources Management (IRM) professionals successfully integrate human creativity and ingenuity with the most sophisticated computer systems.

The result: we're discovering new ways to program tomorrow.

You can work in one of the world's most advanced high technology environments. Its environment is ideally situated between Los Angeles and Orange County in Southern California. We have immediate openings for the following:

• Data Processing Equipment Configuration Specialists • IBM Database Specialists • IBM Systems Programmer • SMC, VPM, MCP Systems Programmer • Performance Specialists • Scientific Programmers/Analysts (Engineering and Manufacturing) • Change & Control Management • Computer Aided Design (CAD) Specialists • Data Control Systems Specialists • Network Design Specialists • EDP Auditors

Please send your resume to: Dave O'Leary

• Sr. Systems Systems Programmer/Analysts • Operations Specialists • Operations/Help Control Analysts • Data Entry Analysts • Computer Operations Staff Supervisors

Please send your resume to: Gary Adams

Relocation assistance is available.

The location, origin and duration of these career pursuits are further highlighted through some of the most sought-after comprehensive personal benefit arrangements available. Please send your resume to the appropriate contact person at: Computer Systems Employment Office, Dept. CSE 602, P.O. Box 1010, Pico Plaza, Los Angeles, CA 90069-0007.

PROOF OF U.S. CITIZENSHIP REQUIRED. Northrop is an Equal Opportunity Employer M/F/V/H.

NORTHROP

We're within your reach.

Advanced Systems Division
Aircraft Group

Programmer

You need CISCAL and DMS II applications programming on a VAX/VMS 11/780 and/or 11/730 computer system.

Your responsibilities will include: Program development, testing, and debugging; system and software support.

We offer generous compensation and benefits, a thoroughly professional environment, and opportunity for professional career growth. Please send your resume indicating salary history in confidence to:

Charles F. Smith
Personnel Resources Specialist
NORTHROP CORPORATION
P.O. Box 11944
Dallas International Airport
Dallas, TX 75261-9444
An Equal Opportunity Employer M/F

SOUTHWEST OPPORTUNITIES

(Summit Included)

Programmers/Analysts
Systems Analysts
Systems Programmers
\$25,000 to \$50,000

Our clients range in size from small consulting firms to Fortune 500 companies throughout the Southwest.

RCI

Our reputation is built on performance.

Send resume, do not list prior work, 2000 555-4040
10000 N. Central Expressway, Suite 100
Dallas, Texas 75243
Will consider relocation
Phoenix, AZ 85028

POSITION ANNOUNCEMENTS

POSITION ANNOUNCEMENTS

POSITION ANNOUNCEMENTS

POSITION ANNOUNCEMENTS

POSITION ANNOUNCEMENTS



TECHNICAL AND APPLICATIONS PROGRAMMERS

Don't be a spectator. Join Lockheed Space Operations Company as you prepare for the first of many shuttle launches from the West Coast. It will all happen from Vandenberg AFB, on the beautiful central California coast. As prime contractor, Lockheed is involved in the preparation, launch, landing and turnaround activities of the entire shuttle fleet. This requires talented individuals.

Right now, we're looking for programmers whose ideas and experience will establish Vandenberg as the country's west coast spaceport. Specifically, openings are available in the following areas:

TP Administrator
Applications Support Programmer
Software Configuration Coordinator

You will analyze and support data-based applications, management information systems and related functions. GCOS, COBOL, IDS, GIMAR DMIIV and other related experience for a Honeywell DP58/70 host system is required.

There are ground force opportunities that will put you right in the middle of America's most exciting space program. The experience you bring will be enhanced by the resources and benefits of a well established Fortune 100 company. For consideration, send your resume to Lockheed Space Operations Company, Employment Office, Dept. CW56, 100 W. Laurel Ave., Suite C, Longport, California 93046. Lockheed is an equal opportunity, affirmative action employer. U.S. citizenship is required.

Lockheed
Space Operations Company
Giving shape to imagination.

EDP/Systems Auditors

Fast-Track Opportunities in a Dynamic Corporate Environment

Electronic Data Systems (EDS) Corporation is one of America's fastest growing and most widely-respected companies. We are currently undergoing dynamic corporate-wide expansion due to our recent alliance with General Motors (GM) Corporation, and we have opportunities in Dallas and Detroit for EDP and Systems Auditors with strong communication skills who will interface with all levels of management.

EDP AUDITOR
Requires a minimum of 3 years data processing experience and some background with applications, security and general control concepts. An accounting or computer science degree preferred. You will work independently, and some travel is involved.

FINANCIAL SYSTEMS AUDITOR
Requires 2 - 5 years financial systems experience and a degree in accounting. A CPA or CIA is a plus. Minimum travel is required.

If you are motivated by quality performance and tremendous career potential, you could share in EDS' success. We offer competitive salaries, an outstanding company-paid benefits package and a professional, stable environment. Please send your resume to confidential to:

Joe Brown
Electronic Data Systems Corporation
Corporate Headquarters Recruiting
15000 Park Center Dr.
Suite 500, Dept. 10071285A
Dallas, TX 75261

EDS

Electronic Data Systems Corporation

An Equal Opportunity Employer

MANAGER OF ADMINISTRATION DATA PROCESSING
We are seeking a Manager of Administration Data Processing for our Dallas office. The Manager will be responsible for the day-to-day operation of the data processing department. The Manager will be responsible for the selection, training, and supervision of the staff. The Manager will be responsible for the development and implementation of the data processing department's policies and procedures. The Manager will be responsible for the maintenance and repair of the data processing equipment. The Manager will be responsible for the coordination of the data processing department's activities with the other departments of the company. The Manager will be responsible for the preparation and presentation of reports to the company's management. The Manager will be responsible for the maintenance and repair of the data processing equipment. The Manager will be responsible for the coordination of the data processing department's activities with the other departments of the company. The Manager will be responsible for the preparation and presentation of reports to the company's management.

PROJECT LEADERSHIP
We are seeking a Project Leader for our Dallas office. The Project Leader will be responsible for the day-to-day operation of the project. The Project Leader will be responsible for the selection, training, and supervision of the staff. The Project Leader will be responsible for the development and implementation of the project's policies and procedures. The Project Leader will be responsible for the maintenance and repair of the project's equipment. The Project Leader will be responsible for the coordination of the project's activities with the other departments of the company. The Project Leader will be responsible for the preparation and presentation of reports to the company's management. The Project Leader will be responsible for the maintenance and repair of the project's equipment. The Project Leader will be responsible for the coordination of the project's activities with the other departments of the company. The Project Leader will be responsible for the preparation and presentation of reports to the company's management.

Don't trust us to keep your classified information secret

Every week, we deliver more of your target audience than any other publication. Over 800,000 computer- or network-related professionals, including MIS/DP directors, systems analysts, programmers, and engineers—as well as corporate presidents, treasurers, and other top executives.

And we deliver these readers for less. Compare costs and the people reached. You'll see that we're the most cost-effective medium for reaching MIS/DP professionals.

Our readers rely on Computerworld's classified section. In fact, 41% of our subscribers read the recruitment section every week. And 50% of our subscribers read this section regularly.

Readership is the life source of our business. Just ask some of the 4,000 organizations that run more than 8,500 recruitment ads in Computerworld in 1984.

We make your ads work harder. Because we divide the classified section into logical categories: Position Announcement, Buy, Sell, Swap, Software For Sale, Time & Services, and The Bulletin Board. (Available on request: Software Market, Business Opportunities, and Real Estate.)

To the people you want to reach we'll send your ads looking for your ad, and more time reading it.

We'll even bypass your ad if no extra charge. All you need to do is attach cash payment when you place your order. Payment due within 10 days. Or give us your order over the phone. We'll do the rest.

And since we're published weekly, we can offer you a fast turn-around from when you place your order to when your ad appears. As little as 10 days.

The next time you want results, advertise in Computerworld classified pages. Call toll-free at (800) 343-8474. In Massachusetts, call (617) 879-0700. Get now.

COMPUTERWORLD

Box 880
375 Cochituate Road
Frammingham, MA 01701

COMPUTER PROFESSIONALS

UTAH
EYRING RESEARCH INSTITUTE, a high technology research and development organization, with the following immediate openings:

SYSTEM LEVEL PROGRAMMERS

Salt Lake City

We are seeking qualified personnel with BS in CE or Engineering or equivalent with at least two years experience in one of the following: **MINIBUS** - Host time simulation - High speed data communications - **FORTRAN "C"** and/or **ALGOL "X"**.

TANDEM - Computer-aided dispatching - Operating systems - **COBOL** and/or **TAL**.
RSP-11 - High speed data communications - System programming - **FORTRAN** and **ASSEMBLY** - **PER-11** experience.

PROGRAMMERS

DEMS & STATISTICAL/MATHEMATICAL
Classified - MS AP

Expanded career opportunities at AFM Air Force Base create openings for BS and MS degree holders with two or more years in DEMS development and/or statistical/mathematical programming. 10-15000 experience helpful. Openings include Senior Level Data Processing Programmer.

MANUFACTURING SYSTEMS ANALYSTS

Provo

Computer Integrated Manufacturing systems experience on large systems with evaluation and analysis skills utilizing IBM and/or TANDEM equipment. These positions involve working with Fortune 500 manufacturing companies on large projects in CAD involving data base control, performing initial systems analysis, requirements definition and systems design. Requires a BS in CE or Engineering or equivalent and significant applicable experience.

Upon offers plenty of recreational opportunities, wholesome family lifestyle and excellent cultural activities. Affordable housing is available. Please send resume, including salary requirements and which position you are applying for, to: **Hanson Resources**.



EYRING RESEARCH INSTITUTE

1400 West 620 North, Provo, Utah 84601, 801-735-9434

An Equal Opportunity Employer

Computer Repair Field Engineers

We're on the crest of a new wave . . .

Sorbus is officially a

Bell Atlantic Company!

For years you've been the Number 1 rated computer maintenance company in the industry. Now, as a Bell Atlantic Company, we expect to grow even faster and to expand our service offerings, which will provide greater career opportunities for our computer field engineers. If you're ready to rise to the challenge to join the repair of IBM MAINFRAMES and PERIPHERALS (or comparable such as STC) please call Robert Henderson, general manager, for more resume to her at Sorbus, Inc., 26 E. Broadfield Road, Provo, UT 84601.

Sorbus

A Bell Atlantic Company

Belmont is an Affirmative Action Employer

PROJECT LEADER

Based near Airport? Direct activities of programmers and analysts during development of management information system and related. Requires 2-4 years project leadership, IBM and financial or manufacturing system. Screening background a plus. Call Mark David or Tom Smith at (202) 339-9141.

SYSTEMS ANALYST

2000 N. 1st Street

Washington, DC 20002

COMPUTER EQUIPMENT BROKER

Highly experienced individual ready to immediately handle brokerage and operations department for large Chicago area leasing company. Income potential and in excess of \$100,000. For consideration please send resume to: Information to Box Number CW-84026, Computerworld, Box 84026, Frammingham, MA 01701.

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS

FORUM ANNOUNCEMENTS



Bank of America

Manager, Technology Projects-Networks

Our Technology and Communications Service Division, based in the San Francisco Bay Area, is currently seeking an experienced manager. Along with managing a staff of 20+ technical professionals, the successful candidate will provide overall direction on the telecommunications activities associated with our new technology center, as well as our Bank-American phone and ATM systems.

You should have 5-10 years experience in telecommunications networking, including both voice and data. Strong project management abilities and proven managerial skills are essential. A BS degree is required; an advanced business degree would be helpful. Candidates must possess excellent oral and written communications skills.

We offer an outstanding salary, relocation and benefits package designed to attract and retain top professional talent. Interested and qualified candidates are invited to send resumes with salary requirements to: Bank of America, BASE Human Resource Management, Dept. 3228-CW56, P.O. Box 37000, San Francisco, CA 94137. An equal opportunity employer.

Share Our Strategy. Strengthen Your Team.



Bank of America

IMMEDIATE OPENINGS

SPL SOFTWARE ENGINEERS SOFTWARE ENGINEERS

(Min. 3 yrs. experience)

Join the world leader in
Computerized Mapping/Graphics
and Data Base Management
Systems and Services.

Applicants should have experience in:

- Microcomputers
- Fortran and/or PL/I
- Structured analysis, design and programming techniques
- Applications design and development
- Data General software and hardware

- Outstanding career opportunities and challenging assignments.
- Competitive salaries and comprehensive benefits package.
- Relocation allowances (in Colorado).

Send your resume, with salary history and requirements to:
Laura Thompson-Johnson, Personnel Manager


**BUTLER
COMPUTER
GRAPHICS**

Dept. CH, 2000 West Evans Avenue, Denver, CO 80202
An Equal Opportunity Employer
507/572

VM/CMS

A world leader in software products and services for large IBM & MVS environments is seeking for:

VM Environment:

If you have 3-5 years of IBM Assembler programming language experience, understand CP commands, have a degree in Computer Science and required, but not essential, have good verbal and written communication skills, we want to hear from you!

VM PRODUCTS:

If you have a VM product that you have developed and would like a salary letter to take it to market for you, send us a brief description of that product and we will contact you!

Send resumes and/or product descriptions to: Tom (Jim) Giddens, Computerworld, Inc. 800, Framingham, MA 01701.

WE
WANT

WE
WANT

MANAGER PRODUCT PLANNING SOFTWARE PRODUCTS

When it comes to moving ahead in the software product and professional services industry, Outspan's success is unmatched. Beginning 12 years ago with three people, Outspan has grown to become a dynamic company with 150 million in annual revenues and 700 professionals in a national network of offices.

The key to our growing success is our commitment to supporting success-driven professionals. By offering opportunities for rapid career advancement and technical training, we are able to attract and retain the most talented professionals. If you are ready to become part of a company that's really on the move, consider Outspan.

Our tremendous growth has created an immediate need in our Birmingham, Michigan headquarters for a Manager of Product Planning in our software products

group. You will originate and research new product ideas, convey these ideas to our technical team, and follow through to final product development. This position has a major responsibility to provide all new product definition and specifications.

To qualify for this challenging, highly-stimulating position, you must have a solid background in the IBM user marketplace, enter project manager experience, and experience directing senior technical people in a software development environment. A BS/CS, or equivalent, is necessary; MBA preferred.

We offer paid relocation, excellent compensation, and one of the most comprehensive benefits packages in the industry. To explore this opportunity, call Chuck Brille (ext. 240), 5 yrs. exp. (EST) at 1-800-285-7438 (in Michigan call 313-940-0800) or rush your resume to:

COMPUWARE

38140 Telegraph Road, Suite 204 • Birmingham, AL 35296

Amesbury • Baltimore • Boston • Dallas • Detroit • Hartford
Houston • Jacksonville • New York • Philadelphia • St. Louis • San Francisco
Seattle • Tampa • Washington D.C.
Atlanta • Chicago • Denver • Fort Lauderdale
Japan • Mexico • St. Paul
Equal Opportunity Employer

PRODUCT SUPPORT ANALYST

Our growing business with "Fortune 500" companies creates an opportunity to work with Iconix' TIVAS-FORM, a 5th generation expert system. You'll help clients create applications systems automatically in the IMS DC environment.

Iconix seeks talented people with 3-5 years IMS DBA or Design experience and COBOL knowledge. If you are a good communicator willing to travel you'll get careful consideration.

Please reply to:
Iconix, Inc.

National Product Manager
8888 E. Via De Ventura
Scottsdale, AZ 85268

An Equal Opportunity Employer

MANAGER, ELECTRONIC SYSTEMS DIVISION

Department of Transportation

Major program responsible for acquisition and installation of computerized and non-computerized systems for the Department of Transportation. This position is responsible for the overall management of the program and for the technical and administrative aspects of the program.

Requires both management and technical skills and experience.

Minimum degree is BS. Qualifying degree in design engineering or systems engineering. Must have 5 years of experience in the design and development of computerized systems.

Interested persons should send resume and salary history to:

Department of Transportation
Electronic Systems Division
Office of Management and Administration
400 West Trade Street
Columbus, GA 31904

EOE M/F/H/V

TECHNICAL MANAGEMENT

Computer Facility Director

Responsible for maintenance and operation of hardware and software for the Stanford University School of Business computer facilities consisting of three DEC minisystems, over 300 terminals, and 300 personal computers. You will supervise applications development and support activities and perform planning and budgeting to serve the research, teaching, and administrative information processing needs of students, staff, and faculty.

You must have strong analytical, management, and communication skills. Knowledge of business administration theory and business related applications software on minisystems and microcomputers is required. Other qualifications include management experience in computer technology and a demonstrated working knowledge of DEC System 30 and VAX mainframe/minicomputer hardware, IBM, HP, Apple, and DEC microcomputers, and TOPS 20, UNIX, VMS, and MS-DOS operating systems. Skills and knowledge of the hardware hardware and software are desired.

Assistant Director of Operations

Qualifications are similar to the director, but with strong operations experience.

Assistant Director of Applications

Qualifications are similar to the director, but with strong applications experience.

Please send resume and cover letter to: Vannette Wilkins, Room 3070, 3070 CH, Pleasanton, CA 94566, Stanford, CA 94305.

Equal Opportunity Employer Through Affirmative Action.

*UNIT is a trademark of IBM Corporation.

**Stanford
University**

BUY SELL GROUP

BUY SELL GROUP

BUY SELL GROUP

BUY SELL GROUP

BUY SELL GROUP

LEASE • PURCHASE • SELL IBM SYSTEMS

- Purchase-Lease Back
- Upgrade Flexibility
- Customized Leasing
- All models & peripherals

CALL US TODAY

612/936-0226

WINTHROP

RESOURCES CORPORATION

Computer Sales and Leasing Division

100 PLEASANTER • 700 BRYAN ROAD EAST • MINNETONKA, MN 55330

MEL
KLEIN
EL CAMINO
RESOURCES LTD.

**3083E
16X16**
AVAILABLE IMMEDIATELY
Sale or Lease

3090-200
AVAILABLE DEC. 1985
Lease Only

WANT TO BUY
3083/3081
Fourth Quarter 1985

Call MEL KLEINMAN
(800) 821-0229 (818) 986-2411

In California

EL CAMINO
4827 N. Sepulveda Blvd.
Sherman Oaks, CA 91403

RESOURCES LTD.

Check us out



for DEC

and/or
DEC serviced compatibles

VAX PVL 780

11/70, 78, 44, 24, 16

All immediate & guaranteed

Everything from 1.4MB to 16K

DATAWARE

SYSTEMS LEASE

800-221-4318

30 Day R.L. N.Y. 10001

(718) 407-0811 TELEX 463444

TWX 700000-4770

DEC is a registered trademark of Digital Corporation

IBM SERIES/1

SAVE UP TO 60%

ALL MODELS & PERIPHERALS

NEW & USED

1, 2 & 3 YEAR RENTALS

IBM System/38

ALL MODELS • FEATURES & UPGRADES
SPECIAL LEASE PROGRAMS

IBM System/36

ALL MODELS • QUICK DELIVERY
SPECIAL Option+Plus+Lease* PLAN

IBM System/34

TOP SAVINGS • QUICK DELIVERY
SHORT & LONG TERM LEASES
MEMORY • FEATURES • UPGRADES

4331 • 4341

FEATURES • MEMORY • UPGRADES

SAVE 40% to 75%

NEW OR USED • QUICK DELIVERY

4361 • 4381

308X • 3090

LOW LEASE RATES
FLEXIBLE LEASE OPTIONSTERMINALS/COMMUNICATIONS
DISK • PRINTERS • TAPE

3175 • 3176 • 3275

3274 • 3276

3370 • 3375 • 3380

3480 • 3705 • 3725

3805 • 3890 • 3895

3985 • 3995 • 4345

LEASING?

Call Computer Options
for YOUR BEST RATES
& LEASE OPTIONS

CALL TOLL FREE

800/328-5718

(In Minnesota — 812/544-8880)

**COMPUTER
OPTIONS, INC.**

1000 SOUTH HWY. 100 • MINNEAPOLIS, MN 55416

GO! "Your best option"


SALE OR LEASE

NEW VINT RECORD MACHINES

030-030-030-030-030

030-030-030-030-030

030-030-030-030-030

NEW & USED

DISK PACKS-DATA MODULES

2310-2300(1)-2300(1)-2300(1)

Model Type-03000000

Every Item Guaranteed

Highest Prices Paid for Used Packs & Modules

CALL FOR PC AT'S & PERIPHERALS

Call

Karen Jones at

312/608-3000

Ext. 2128

COMDICO

Comdico, Inc., 6000 Shaker Court

Plymouth, Illinois 60546

COM

COM

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

IBM

800
258-2233

MISSISSIPPI CENTRAL DATA PROCESSING AUTHORITY
Sealed proposals will be received by the COPA, 606 Robert E. Lee Building, Jackson, MS 39201 for the following data processing equipment and services:
Required for Request No. 1913, due 2:30 p.m., Thursday, May 23, 1985, for the acquisition, design, installation and implementation of a microcomputer Local Area Network for the College of Business and Industry at MISSISSIPPI STATE UNIVERSITY.
Detailed specifications may be obtained from the COPA office. The COPA reserves the right to reject any and all bids and proposals and to waive informality.

Lisa Whitworth or Shelia Kinross
State Central Data Processing Authority
601/938-1388

**FORSYTHE
McARTHUR ASSOCIATES INC.**

**NEED TO BUY
4341-2's And 12's**

Hickory: Hickory, E. (312) 875-8800
Atlanta (404) 953-9457
Denver (303) 890-3407
Detroit (313) 556-1272
Minneapolis (612) 785-8544
Stamford, CT (203) 338-8548
St. Louis 314-991-1718

SERIES L

NEW, USED, FEATURES, & CDC PERIPHERALS.
HARD TO FIND NEW PRODUCTS IN STOCK.

34, 36, 32.

80% UNDER IBM LIST.
72 HOUR UPGRADES, 528 FEATURES.

4331/4341

TAPE, DISK, PRINTERS,
FLEXIBLE LEASE ALTERNATIVES.

500, 5120, 5/23.

DISPLAY/WRITERS IN STOCK NOW.

800/328-3884

IN MINNESOTA, CALL 612/830-8280

We do an exceptional
job—our clients do
repeat business.

HERZOG COMPUTER SALES
10750 Bren Road East
Minnetonka, MN 55343

Exceptional!
X

2370

A&B Models

Auto 1970

Columbia

4341's

4341's

4341's

4341's

4341's

4341's

4341's

4341's

2370

2370

2370

2370

2370

2370

2370

2370

2370

2370

2370

2370

Working, Real & Lease With Personalized and Professional Equipment

Computer Alternatives Inc.

PO BOX 11000, MINNETONKA, MN 55304-0100

800/328-3884

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

Computer Sales

DEC

VAX

11/732 11/750 11/760
SYSTEMS — MEMORY
OPTIONS — MODULES
NEW & USED

DEC TERMINALS

LA12AB LA12B
UNUSED
MAKE OFFER
MANY AVAILABLE

FUNTSU

ALL DRIVES AVAILABLE

EMULEX

CONTROLLERS
COMMUNICATIONS

DEC

OPTIONS — MODULES
MEMORY — SPARES

IBM

4870 MOD1 5085-006
3742 3771 3774

NATIONAL

COMPUTER EXCHANGE
600 NORTH LUNAR AVENUE
OREA, CALIFORNIA 92671
714-880-8888

800-824-8298

**THE
SOURCE
FOR
series/1**

• BUY • SELL
• LEASE
NEW OR USED

**DEC VAX 730 (Used 1 Yr.)
System Special**

VAX 11/750, 1 MB, CCR91-02 Lb.
200, 121 Lb. Multitasking Disk
72 Lb. 10 MB Disk
200 Lb. Peripheral Controller
LA12B, Printer
508720-CA, Additional 1 Mb (4 1/2
" 1211 or 1200 Available)

Bank Over 40% Purchase
Or Lease For 95% Financing
(714) 466-6881
80 Columbia Resources Ltd.

**CONVERGENT
TECHNOLOGIES
CORPORATION'S**

5120B Turbo Workstation
10 MB Disk, 600 KB
(2) AWS-218 Turbo with
364K Ram, 8in A-14678
NEC 3325 Spahrner
CALL (800) 243-9738

**BUY www SELL
SWAP**

**Well-Equipped To
Serve You In
Buying or Selling:
HARDWARE
SOFTWARE
COMPUTER TIME
& SERVICES**

Over 500,000 computer people read
COMPUTERWORLD every week. So,
placing an advertisement with us is go-
ing to help you take care of your comput-
er-related business...very quickly.

Deal as in on your business needs.

Call the Classified Department at
1-800-348-6474 or (in Massachusetts)
(617) 879-6760 to place your ad.

IBM

• BUY
• SELL
• LEASE

SERIES-1

34 • 36 • 38 • 23

4300

3370

3375

360L

Specialist
Sales & Production Support - IBM

PCs

AVICOM
CORPORATION

3000 W. COW W.
SPRINGFIELD, ILLINOIS
61101-1001

CALL TOLL FREE
1-800-328-7723

BUY SELL LEASE

BUY SELL LEASE

BUY SELL LEASE

BUY SELL LEASE

BUY SELL LEASE

MARIB

BUY • SELL • MAINTAIN

IBM SYSTEM/34/36

- PROMPT DELIVERY
- ALL SYSTEMS 34 ARE FULLY RECONFIGURED
- ALL SYSTEMS 34/36 CONFIGURED TO YOUR NEEDS
- PERIPHERALS — NEW AND USED
- UPGRADES AND FEATURES INCLUDED AND INSTALLED
- LONG TERM LEASES AT COMPETITIVE PRICES
- SHORT TERM RENTALS
- TRAC-ON ACCEPTED
- GUARANTEED WARE & IBM MAINTENANCE



A PHONE CALL CAN SOLVE ALL YOUR EQUIPMENT PROBLEMS

TALK TO US ... (201) 343-4554



CMI

A LEADING SPECIALIST
SERVING THE DATA PROCESSING &
TELECOMMUNICATIONS INDUSTRY

Buy • Sell • Lease

3278, 3279
3178/79, 3276

All Models
Buy, Sell, Lease
Immediate Availability

Albany, NJ 908 985-7282
Boston, MA 617 357-4798
Chicago, IL 312 435-4798
Dallas, TX 214 750-0113
Houston, TX 713 750-7188
Irvine, CA 714 750-0444
Jacksonville, FL 904 842-3111
Lexington, KY 606 440-0823
Miami, FL 305 440-0823
Riverside, CA 951 440-0823
St. Louis, MO 314 440-0823
Tampa, FL 813 275-0823
Washington, DC 202 332-7413
Phoenix, AZ 602 944-7188
Tucson, AZ 602 944-7188
Portland, OR 503 251-1211
Reno, NV 702 785-1211
San Francisco, CA 415 392-3888
Seattle, WA 206 465-3888
Vancouver, BC 604 685-4798

CMI FINANCIAL
SERVICES GROUP
2000 Telegraph Rd., P.O. Box 2000
Bloomfield Hills, MI 48304-2000
(313) 456-0000



A Torchmark Company

2000 Telegraph Rd., P.O. Box 2000
Bloomfield Hills, MI 48304-2000
TWX/TELEX: 610-535-1887
CMI CORP. 1984

(313) 456-0000

Member AICO

Member CDA

RENT • BUY • UPGRADE • SELL

POP, 1100, 1100A, 1100B, 1100C, 1100D

POP, 1100A, 1100B, 1100C, 1100D

SYSTEMS • ADD-ONS • TRADE-INS

IBM 700, 700A, 700B, 700C, 700D, 700E, 700F, 700G, 700H, 700I, 700J, 700K, 700L, 700M, 700N, 700O, 700P, 700Q, 700R, 700S, 700T, 700U, 700V, 700W, 700X, 700Y, 700Z, 700AA, 700AB, 700AC, 700AD, 700AE, 700AF, 700AG, 700AH, 700AI, 700AJ, 700AK, 700AL, 700AM, 700AN, 700AO, 700AP, 700AQ, 700AR, 700AS, 700AT, 700AU, 700AV, 700AW, 700AX, 700AY, 700AZ, 700BA, 700BB, 700BC, 700BD, 700BE, 700BF, 700BG, 700BH, 700BI, 700BJ, 700BK, 700BL, 700BM, 700BN, 700BO, 700BP, 700BQ, 700BR, 700BS, 700BT, 700BU, 700BV, 700BW, 700BX, 700BY, 700BZ, 700CA, 700CB, 700CC, 700CD, 700CE, 700CF, 700CG, 700CH, 700CI, 700CJ, 700CK, 700CL, 700CM, 700CN, 700CO, 700CP, 700CQ, 700CR, 700CS, 700CT, 700CU, 700CV, 700CW, 700CX, 700CY, 700CZ, 700DA, 700DB, 700DC, 700DD, 700DE, 700DF, 700DG, 700DH, 700DI, 700DJ, 700DK, 700DL, 700DM, 700DN, 700DO, 700DP, 700DQ, 700DR, 700DS, 700DT, 700DU, 700DV, 700DW, 700DX, 700DY, 700DZ, 700EA, 700EB, 700EC, 700ED, 700EE, 700EF, 700EG, 700EH, 700EI, 700EJ, 700EK, 700EL, 700EM, 700EN, 700EO, 700EP, 700EQ, 700ER, 700ES, 700ET, 700EU, 700EV, 700EW, 700EX, 700EY, 700EZ, 700FA, 700FB, 700FC, 700FD, 700FE, 700FF, 700FG, 700FH, 700FI, 700FJ, 700FK, 700FL, 700FM, 700FN, 700FO, 700FP, 700FQ, 700FR, 700FS, 700FT, 700FU, 700FV, 700FW, 700FX, 700FY, 700FZ, 700GA, 700GB, 700GC, 700GD, 700GE, 700GF, 700GG, 700GH, 700GI, 700GJ, 700GK, 700GL, 700GM, 700GN, 700GO, 700GP, 700GQ, 700GR, 700GS, 700GT, 700GU, 700GV, 700GW, 700GX, 700GY, 700GZ, 700HA, 700HB, 700HC, 700HD, 700HE, 700HF, 700HG, 700HH, 700HI, 700HJ, 700HK, 700HL, 700HM, 700HN, 700HO, 700HP, 700HQ, 700HR, 700HS, 700HT, 700HU, 700HV, 700HW, 700HX, 700HY, 700HZ, 700IA, 700IB, 700IC, 700ID, 700IE, 700IF, 700IG, 700IH, 700II, 700IJ, 700IK, 700IL, 700IM, 700IN, 700IO, 700IP, 700IQ, 700IR, 700IS, 700IT, 700IU, 700IV, 700IW, 700IX, 700IY, 700IZ, 700JA, 700JB, 700JC, 700JD, 700JE, 700JF, 700JG, 700JH, 700JI, 700JJ, 700JK, 700JL, 700JM, 700JN, 700JO, 700JP, 700JQ, 700JR, 700JS, 700JT, 700JU, 700JV, 700JW, 700JX, 700JY, 700JZ, 700KA, 700KB, 700KC, 700KD, 700KE, 700KF, 700KG, 700KH, 700KI, 700KJ, 700KK, 700KL, 700KM, 700KN, 700KO, 700KP, 700KQ, 700KR, 700KS, 700KT, 700KU, 700KV, 700KW, 700KX, 700KY, 700KZ, 700LA, 700LB, 700LC, 700LD, 700LE, 700LF, 700LG, 700LH, 700LI, 700LJ, 700LK, 700LL, 700LM, 700LN, 700LO, 700LP, 700LQ, 700LR, 700LS, 700LT, 700LU, 700LV, 700LW, 700LX, 700LY, 700LZ, 700MA, 700MB, 700MC, 700MD, 700ME, 700MF, 700MG, 700MH, 700MI, 700MJ, 700MK, 700ML, 700MM, 700MN, 700MO, 700MP, 700MQ, 700MR, 700MS, 700MT, 700MU, 700MV, 700MW, 700MX, 700MY, 700MZ, 700NA, 700NB, 700NC, 700ND, 700NE, 700NF, 700NG, 700NH, 700NI, 700NJ, 700NK, 700NL, 700NM, 700NN, 700NO, 700NP, 700NQ, 700NR, 700NS, 700NT, 700NU, 700NV, 700NW, 700NX, 700NY, 700NZ, 700OA, 700OB, 700OC, 700OD, 700OE, 700OF, 700OG, 700OH, 700OI, 700OJ, 700OK, 700OL, 700OM, 700ON, 700OO, 700OP, 700OQ, 700OR, 700OS, 700OT, 700OU, 700OV, 700OW, 700OX, 700OY, 700OZ, 700PA, 700PB, 700PC, 700PD, 700PE, 700PF, 700PG, 700PH, 700PI, 700PJ, 700PK, 700PL, 700PM, 700PN, 700PO, 700PP, 700PQ, 700PR, 700PS, 700PT, 700PU, 700PV, 700PW, 700PX, 700PY, 700PZ, 700QA, 700QB, 700QC, 700QD, 700QE, 700QF, 700QG, 700QH, 700QI, 700QJ, 700QK, 700QL, 700QM, 700QN, 700QO, 700QP, 700QQ, 700QR, 700QS, 700QT, 700QU, 700QV, 700QW, 700QX, 700QY, 700QZ, 700RA, 700RB, 700RC, 700RD, 700RE, 700RF, 700RG, 700RH, 700RI, 700RJ, 700RK, 700RL, 700RM, 700RN, 700RO, 700RP, 700RQ, 700RR, 700RS, 700RT, 700RU, 700RV, 700RW, 700RX, 700RY, 700RZ, 700SA, 700SB, 700SC, 700SD, 700SE, 700SF, 700SG, 700SH, 700SI, 700SJ, 700SK, 700SL, 700SM, 700SN, 700SO, 700SP, 700SQ, 700SR, 700SS, 700ST, 700SU, 700SV, 700SW, 700SX, 700SY, 700SZ, 700TA, 700TB, 700TC, 700TD, 700TE, 700TF, 700TG, 700TH, 700TI, 700TJ, 700TK, 700TL, 700TM, 700TN, 700TO, 700TP, 700TQ, 700TR, 700TS, 700TT, 700TU, 700TV, 700TW, 700TX, 700TY, 700TZ, 700UA, 700UB, 700UC, 700UD, 700UE, 700UF, 700UG, 700UH, 700UI, 700UJ, 700UK, 700UL, 700UM, 700UN, 700UO, 700UP, 700UQ, 700UR, 700US, 700UT, 700UU, 700UV, 700UW, 700UX, 700UY, 700UZ, 700VA, 700VB, 700VC, 700VD, 700VE, 700VF, 700VG, 700VH, 700VI, 700VJ, 700VK, 700VL, 700VM, 700VN, 700VO, 700VP, 700VQ, 700VR, 700VS, 700VT, 700VU, 700VV, 700VW, 700VX, 700VY, 700VZ, 700WA, 700WB, 700WC, 700WD, 700WE, 700WF, 700WG, 700WH, 700WI, 700WJ, 700WK, 700WL, 700WM, 700WN, 700WO, 700WP, 700WQ, 700WR, 700WS, 700WT, 700WU, 700WV, 700WW, 700WX, 700WY, 700WZ, 700XA, 700XB, 700XC, 700XD, 700XE, 700XF, 700XG, 700XH, 700XI, 700XJ, 700XK, 700XL, 700XM, 700XN, 700XO, 700XP, 700XQ, 700XR, 700XS, 700XT, 700XU, 700XV, 700XW, 700XX, 700XY, 700XZ, 700YA, 700YB, 700YC, 700YD, 700YE, 700YF, 700YG, 700YH, 700YI, 700YJ, 700YK, 700YL, 700YM, 700YN, 700YO, 700YP, 700YQ, 700YR, 700YS, 700YT, 700YU, 700YV, 700YW, 700YX, 700YY, 700YZ, 700ZA, 700ZB, 700ZC, 700ZD, 700ZE, 700ZF, 700ZG, 700ZH, 700ZI, 700ZJ, 700ZK, 700ZL, 700ZM, 700ZN, 700ZO, 700ZP, 700ZQ, 700ZR, 700ZS, 700ZT, 700ZU, 700ZV, 700ZW, 700ZX, 700ZY, 700ZZ

IBM 700, 700A, 700B, 700C, 700D, 700E, 700F, 700G, 700H, 700I, 700J, 700K, 700L, 700M, 700N, 700O, 700P, 700Q, 700R, 700S, 700T, 700U, 700V, 700W, 700X, 700Y, 700Z, 700AA, 700AB, 700AC, 700AD, 700AE, 700AF, 700AG, 700AH, 700AI, 700AJ, 700AK, 700AL, 700AM, 700AN, 700AO, 700AP, 700AQ, 700AR, 700AS, 700AT, 700AU, 700AV, 700AW, 700AX, 700AY, 700AZ, 700BA, 700BB, 700BC, 700BD, 700BE, 700BF, 700BG, 700BH, 700BI, 700BJ, 700BK, 700BL, 700BM, 700BN, 700BO, 700BP, 700BQ, 700BR, 700BS, 700BT, 700BU, 700BV, 700BW, 700BX, 700BY, 700BZ, 700CA, 700CB, 700CC, 700CD, 700CE, 700CF, 700CG, 700CH, 700CI, 700CJ, 700CK, 700CL, 700CM, 700CN, 700CO, 700CP, 700CQ, 700CR, 700CS, 700CT, 700CU, 700CV, 700CW, 700CX, 700CY, 700CZ, 700DA, 700DB, 700DC, 700DD, 700DE, 700DF, 700DG, 700DH, 700DI, 700DJ, 700DK, 700DL, 700DM, 700DN, 700DO, 700DP, 700DQ, 700DR, 700DS, 700DT, 700DU, 700DV, 700DW, 700DX, 700DY, 700DZ, 700EA, 700EB, 700EC, 700ED, 700EE, 700EF, 700EG, 700EH, 700EI, 700EJ, 700EK, 700EL, 700EM, 700EN, 700EO, 700EP, 700EQ, 700ER, 700ES, 700ET, 700EU, 700EV, 700EW, 700EX, 700EY, 700EZ, 700FA, 700FB, 700FC, 700FD, 700FE, 700FF, 700FG, 700FH, 700FI, 700FJ, 700FK, 700FL, 700FM, 700FN, 700FO, 700FP, 700FQ, 700FR, 700FS, 700FT, 700FU, 700FV, 700FW, 700FX, 700FY, 700FZ, 700GA, 700GB, 700GC, 700GD, 700GE, 700GF, 700GG, 700GH, 700GI, 700GJ, 700GK, 700GL, 700GM, 700GN, 700GO, 700GP, 700GQ, 700GR, 700GS, 700GT, 700GU, 700GV, 700GW, 700GX, 700GY, 700GZ, 700HA, 700HB, 700HC, 700HD, 700HE, 700HF, 700HG, 700HH, 700HI, 700HJ, 700HK, 700HL, 700HM, 700HN, 700HO, 700HP, 700HQ, 700HR, 700HS, 700HT, 700HU, 700HV, 700HW, 700HX, 700HY, 700HZ, 700IA, 700IB, 700IC, 700ID, 700IE, 700IF, 700IG, 700IH, 700II, 700IJ, 700IK, 700IL, 700IM, 700IN, 700IO, 700IP, 700IQ, 700IR, 700IS, 700IT, 700IU, 700IV, 700IW, 700IX, 700IY, 700IZ, 700JA, 700JB, 700JC, 700JD, 700JE, 700JF, 700JG, 700JH, 700JI, 700JJ, 700JK, 700JL, 700JM, 700JN, 700JO, 700JP, 700JQ, 700JR, 700JS, 700JT, 700JU, 700JV, 700JW, 700JX, 700JY, 700JZ, 700KA, 700KB, 700KC, 700KD, 700KE, 700KF, 700KG, 700KH, 700KI, 700KJ, 700KK, 700KL, 700KM, 700KN, 700KO, 700KP, 700KQ, 700KR, 700KS, 700KT, 700KU, 700KV, 700KW, 700KX, 700KY, 700KZ, 700LA, 700LB, 700LC, 700LD, 700LE, 700LF, 700LG, 700LH, 700LI, 700LJ, 700LK, 700LM, 700LN, 700LO, 700LP, 700LQ, 700LR, 700LS, 700LT, 700LU, 700LV, 700LW, 700LX, 700LY, 700LZ, 700MA, 700MB, 700MC, 700MD, 700ME, 700MF, 700MG, 700MH, 700MI, 700MJ, 700MK, 700ML, 700MM, 700MN, 700MO, 700MP, 700MQ, 700MR, 700MS, 700MT, 700MU, 700MV, 700MW, 700MX, 700MY, 700MZ, 700NA, 700NB, 700NC, 700ND, 700NE, 700NF, 700NG, 700NH, 700NI, 700NJ, 700NK, 700NL, 700NM, 700NN, 700NO, 700NP, 700NQ, 700NR, 700NS, 700NT, 700NU, 700NV, 700NW, 700NX, 700NY, 700NZ, 700OA, 700OB, 700OC, 700OD, 700OE, 700OF, 700OG, 700OH, 700OI, 700OJ, 700OK, 700OL, 700OM, 700ON, 700OO, 700OP, 700OQ, 700OR, 700OS, 700OT, 700OU, 700OV, 700OW, 700OX, 700OY, 700OZ, 700PA, 700PB, 700PC, 700PD, 700PE, 700PF, 700PG, 700PH, 700PI, 700PJ, 700PK, 700PL, 700PM, 700PN, 700PO, 700PP, 700PQ, 700PR, 700PS, 700PT, 700PU, 700PV, 700PW, 700PX, 700PY, 700PZ, 700QA, 700QB, 700QC, 700QD, 700QE, 700QF, 700QG, 700QH, 700QI, 700QJ, 700QK, 700QL, 700QM, 700QN, 700QO, 700QP, 700QQ, 700QR, 700QS, 700QT, 700QU, 700QV, 700QW, 700QX, 700QY, 700QZ, 700RA, 700RB, 700RC, 700RD, 700RE, 700RF, 700RG, 700RH, 700RI, 700RJ, 700RK, 700RL, 700RM, 700RN, 700RO, 700RP, 700RQ, 700RR, 700RS, 700RT, 700RU, 700RV, 700RW, 700RX, 700RY, 700RZ, 700SA, 700SB, 700SC, 700SD, 700SE, 700SF, 700SG, 700SH, 700SI, 700SJ, 700SK, 700SL, 700SM, 700SN, 700SO, 700SP, 700SQ, 700SR, 700SS, 700ST, 700SU, 700SV, 700SW, 700SX, 700SY, 700SZ, 700TA, 700TB, 700TC, 700TD, 700TE, 700TF, 700TG, 700TH, 700TI, 700TJ, 700TK, 700TL, 700TM, 700TN, 700TO, 700TP, 700TQ, 700TR, 700TS, 700TT, 700TU, 700TV, 700TW, 700TX, 700TY, 700TZ, 700UA, 700UB, 700UC, 700UD, 700UE, 700UF, 700UG, 700UH, 700UI, 700UJ, 700UK, 700UL, 700UM, 700UN, 700UO, 700UP, 700UQ, 700UR, 700US, 700UT, 700UU, 700UV, 700UW, 700UX, 700UY, 700UZ, 700VA, 700VB, 700VC, 700VD, 700VE, 700VF, 700VG, 700VH, 700VI, 700VJ, 700VK, 700VL, 700VM, 700VN, 700VO, 700VP, 700VQ, 700VR, 700VS, 700VT, 700VU, 700VV, 700VW, 700VX, 700VY, 700VZ, 700WA, 700WB, 700WC, 700WD, 700WE, 700WF, 700WG, 700WH, 700WI, 700WJ, 700WK, 700WL, 700WM, 700WN, 700WO, 700WP, 700WQ, 700WR, 700WS, 700WT, 700WU, 700WV, 700WW, 700WX, 700WY, 700WZ, 700XA, 700XB, 700XC, 700XD, 700XE, 700XF, 700XG, 700XH, 700XI, 700XJ, 700XK, 700XL, 700XM, 700XN, 700XO, 700XP, 700XQ, 700XR, 700XS, 700XT, 700XU, 700XV, 700XW, 700XX, 700XY, 700XZ, 700YA, 700YB, 700YC, 700YD, 700YE, 700YF, 700YG, 700YH, 700YI, 700YJ, 700YK, 700YL, 700YM, 700YN, 700YO, 700YP, 700YQ, 700YR, 700YS, 700YT, 700YU, 700YV, 700YW, 700YX, 700YY, 700YZ, 700ZA, 700ZB, 700ZC, 700ZD, 700ZE, 700ZF, 700ZG, 700ZH, 700ZI, 700ZJ, 700ZK, 700ZL, 700ZM, 700ZN, 700ZO, 700ZP, 700ZQ, 700ZR, 700ZS, 700ZT, 700ZU, 700ZV, 700ZW, 700ZX, 700ZY, 700ZZ

CALL FOR OUR FREE CATALOG.

IBM is the registered trademark for Digital Equipment Corp.



BROOKVALE

800-645-1167

Buy • Sell • Lease

S/34
S/36
S/38

IBM



UPGRADES
CPU'S • CPU'S • PRINTERS
ALL MODELS
PURCHASE • LEASE • RENT
SHORT & LONG TERM LEASES

Computer Marketing
of America, Inc.
P.O. Box 71
600 Bryan Street
Old Highway, Tennessee 37136



1-800-251-2670

In Tennessee: 615-947-0871

SYSTEMS
4341 4331
38 36 34
SERIES 1

BUY • SELL • LEASE
COMPUTER
BROOKING, INC.
2576 SHELBY ST.
MEMPHIS, TENNESSEE



CALL
TOLL-FREE
800-226-0465
801-372-0822
PERIPHERALS

3203 3370
327X 3411
3350 3420



Sell IBM
S/1 34
38 UPGRADES
Lowest Prices
36
We Pay Highest
Price For IBM's

When You Think Of Leasing
Anything,
Think Of Comdisco

For Sale, Or To Lease

Wanted To Buy

COMDISCO

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

BUY SELL SWAP

ECONOCOM

REPAIRS AND SPECIAL PRODUCTS BUY • SELL • RENT TEST EQUIPMENT ALL PERIPHERALS HARDWARE & SOFTWARE AT 40% OFF	• 2800-40 • 2800-40, 80P • 2800-40, 160P • 2800-40, 320P • 2800-40, 640P • 2800-40, 1280P • 2800-40, 2560P • 2800-40, 5120P • 2800-40, 10240P • 2800-40, 20480P • 2800-40, 40960P • 2800-40, 81920P • 2800-40, 163840P • 2800-40, 327680P • 2800-40, 655360P • 2800-40, 1310720P • 2800-40, 2621440P • 2800-40, 5242880P • 2800-40, 10485760P • 2800-40, 20971520P • 2800-40, 41943040P • 2800-40, 83886080P • 2800-40, 167772160P • 2800-40, 335544320P • 2800-40, 671088640P • 2800-40, 1342177280P • 2800-40, 2684354560P • 2800-40, 5368709120P • 2800-40, 10737418240P • 2800-40, 21474836480P • 2800-40, 42949672960P • 2800-40, 85899345920P • 2800-40, 171798691840P • 2800-40, 343597383680P • 2800-40, 687194767360P • 2800-40, 1374389534720P • 2800-40, 2748779069440P • 2800-40, 5497558138880P • 2800-40, 10995116277760P • 2800-40, 21990232555520P • 2800-40, 43980465111040P • 2800-40, 87960930222080P • 2800-40, 175921860444160P • 2800-40, 351843720888320P • 2800-40, 703687441776640P • 2800-40, 1407374883553280P • 2800-40, 2814749767106560P • 2800-40, 5629499534213120P • 2800-40, 11258999068426240P • 2800-40, 22517998136852480P • 2800-40, 45035996273704960P • 2800-40, 90071992547409920P • 2800-40, 180143985094819840P • 2800-40, 360287970189639680P • 2800-40, 720575940379279360P • 2800-40, 1441151880758558720P • 2800-40, 2882303761517117440P • 2800-40, 5764607523034234880P • 2800-40, 11529215046068469760P • 2800-40, 23058430092136939520P • 2800-40, 46116860184273879040P • 2800-40, 92233720368547758080P • 2800-40, 184467440737095516160P • 2800-40, 368934881474191032320P • 2800-40, 737869762948382064640P • 2800-40, 1475739525896764129280P • 2800-40, 2951479051793528258560P • 2800-40, 5902958103587056517120P • 2800-40, 11805916207174113034240P • 2800-40, 23611832414348226068480P • 2800-40, 47223664828696452136960P • 2800-40, 94447329657392904273920P • 2800-40, 188894659314785808547840P • 2800-40, 377789318629571617095680P • 2800-40, 755578637259143234191360P • 2800-40, 1511157274518286468382720P • 2800-40, 3022314549036572936765440P • 2800-40, 6044629098073145873530880P • 2800-40, 12089258196146291747061760P • 2800-40, 24178516392292583494123520P • 2800-40, 48357032784585166988247040P • 2800-40, 96714065569170333976494080P • 2800-40, 193428131138340667952988160P • 2800-40, 386856262276681335905976320P • 2800-40, 773712524553362671811952640P • 2800-40, 1547425049106725343623905280P • 2800-40, 3094850098213450687247810560P • 2800-40, 6189700196426901374495621120P • 2800-40, 12379400392853802748992442240P • 2800-40, 24758800785707605497984884480P • 2800-40, 49517601571415210995969768960P • 2800-40, 99035203142830421991939537920P • 2800-40, 198070406285660843983879075840P • 2800-40, 396140812571321687967758151680P • 2800-40, 792281625142643375935516303360P • 2800-40, 1584563250285286751871032606720P • 2800-40, 3169126500570573503742065213440P • 2800-40, 6338253001141147007484130426880P • 2800-40, 12676506002282294014968260853760P • 2800-40, 25353012004564588029936521707520P • 2800-40, 50706024009129176059873043415040P • 2800-40, 101412048018258352119746086830080P • 2800-40, 202824096036516704239492173660160P • 2800-40, 405648192073033408478984347320320P • 2800-40, 811296384146066816957968694640640P • 2800-40, 1622592768292133633915937389281280P • 2800-40, 3245185536584267267831874778562560P • 2800-40, 6490371073168534535663749557125120P • 2800-40, 1298074214633707007132749911450240P • 2800-40, 2596148429267414014265499822900480P • 2800-40, 5192296858534828028530999645800960P • 2800-40, 10384593717069656057060199291761920P • 2800-40, 20769187434139312114120398583523840P • 2800-40, 41538374868278624228240797167047680P • 2800-40, 83076749736557248456481594334095360P • 2800-40, 166153499473114496912963088668190720P • 2800-40, 332306998946228993825926177336381440P • 2800-40, 664613997892457987651852354672762880P • 2800-40, 1329227995784915975303704709355525760P • 2800-40, 2658455991569831950607409418711051520P • 2800-40, 5316911983139663901214818837422103040P • 2800-40, 10633823966279327802429637674844206080P • 2800-40, 21267647932558655604859275349688412160P • 2800-40, 42535295865117311209718550699376824320P • 2800-40, 85070591730234622419437101398753648640P • 2800-40, 170141183460469244838874202797507297280P • 2800-40, 34028236692093848967774840559501459520P • 2800-40, 68056473384187697935549681119002919040P • 2800-40, 136112946768375395871099372238005838080P • 2800-40, 272225893536750791742198744476011676160P • 2800-40, 544451787073501583484397488952023352320P • 2800-40, 1088903574147003166968794977904046704640P • 2800-40, 2177807148294006333937589955808093409280P • 2800-40, 43556142965880126678751799116161868195520P • 2800-40, 87112285931760253357503598232323737390080P • 2800-40, 174224571833520506715071184464646474780160P • 2800-40, 348449143667041013430142368929292949560320P • 2800-40, 696898287334082026860284737858585899120640P • 2800-40, 1393796574680164053720569475717171798241280P • 2800-40, 2787593149360328107441138951434343596482560P • 2800-40, 5575186298720656214882277902868687192965120P • 2800-40, 11150372597441312437764555805737375385930240P • 2800-40, 22300745194882624875529111611474750771960480P • 2800-40, 44601490389765249751058223222949501543920960P • 2800-40, 89202980779530499502116446445899002887841920P • 2800-40, 178405961579060999004228892891788005775683840P • 2800-40, 356811923158121998008457785783576001155377600P • 2800-40, 713623846316243996016915571567520023107553600P • 2800-40, 1427247692632487992033831114313540046215107200P • 2800-40, 285449538526497598406766222862700092430214400P • 2800-40, 570899077052995196813532445725400184860428800P • 2800-40, 1141798154105990393627064891450800369720857600P • 2800-40, 2283596308211980787254129782901600739441715200P • 2800-40, 4567192616423961574508259565803201478883430400P • 2800-40, 9134385232847923149016519131606402957766860800P • 2800-40, 18268770465695846298033038263212805915533721600P • 2800-40, 36537540931391692596066076526425611831067443200P • 2800-40, 7307508186278338519213215305285122366213486400P • 2800-40, 14615016372556677038426430610570244732426972800P • 2800-40, 2923003274511335407685286122114048846445356800P • 2800-40, 5846006549022670815370572244228097328890713600P • 2800-40, 1169201309804534163074114448845618577780142400P • 2800-40, 2338402619609068326148228897691371555560284800P • 2800-40, 4676805239218136652296457795382743111120569600P • 2800-40, 9353610478436273304592915590765486222241139200P • 2800-40, 18707220956872546609185831181530972444482278400P • 2800-40, 37414441913745093218371662363061948888964556800P • 2800-40, 74828883827490186436743324726123897777929113600P • 2800-40, 149657767654980372873486649452247795555858227200P • 2800-40, 299315535309960745746973298904495591111716444400P • 2800-40, 598631070619921491493946597808991182223432888800P • 2800-40, 119726214123984298298789319561798236444686577600P • 2800-40, 239452428247968596597578639123596472889373155200P • 2800-40, 478904856495937193195157278247192945778746310400P • 2800-40, 95780971299187438639031455449438589555749260800P • 2800-40, 191561942598374877278062910899877171111498512000P • 2800-40, 38312388519674975455612582179975434222299702400P • 2800-40, 76624777039349950911225164359950868444599404800P • 2800-40, 153249554078699901822450328719901736889198896000P • 2800-40, 306499108157399803644900657439803573778397792000P • 2800-40, 612998216314799607289801314879607147556795584000P • 2800-40, 1225996432629599215779602629759213511135591168000P • 2800-40, 2451992865259198431559205259518427022271131328000P • 2800-40, 4903985730518396863118410519036854044442262656000P • 2800-40, 9807971461036793726236821038073708088884533312000P • 2800-40, 19615942922073587452473642076147417177769066624000P • 2800-40, 39231885844147174904947284152294834355538133248000P • 2800-40, 78463771688294349809894568304589668711077666648000P • 2800-40, 15692754337658869961979913660917933742215333296000P • 2800-40, 31385508675317739923959827321835867484430666592000P • 2800-40, 62771017350635479847919654643671696888613333184000P • 2800-40, 125542034701270959695839309287343393777726666368000P • 2800-40, 251084069402541919391678618574686775555553333728000P • 2800-40, 502168138805083838783357237149373511111106667456000P • 2800-40, 1004336277610167677566714474298750222222213334912000P • 2800-40, 2008672555220335355133342888597500444444426668824000P • 2800-40, 4017345110440670710266685777195000888888853337696000P • 2800-40, 8034690220881341420533371554390001777777706675392000P • 2800-40, 16069380441762682401066731088780003555555413351184000P • 2800-40, 32138760883525364802133461777560007111111826635776000P • 2800-40, 64277521767050729604266923555120014222223653271552000P • 2800-40, 12855504353410145920853384711002844444472606543110400P • 2800-40, 25711008706820291841706769422005688888952413086220800P • 2800-40, 51422017413640583683413538844011377777904826172441600P • 2800-40, 102844034827281173666867077688022755555809652344883200P • 2800-40, 20568806965456234733373415537604551111161090468876800P • 2800-40, 411376139309124694667468310752091022222212209377376000P • 2800-40, 822752278618249389334936621504182044444424418754752000P • 2800-40, 1645504557236498778669873243008364088888848837509504000P • 2800-40, 3291009114472997557339746486016728177777797675019008000P • 2800-40, 6582018228945995114679492972033456355555595350038016000P • 2800-40, 13164036457891990229358985944066927111111190700076032000P • 2800-40, 263280729157839804587179718880138542222222181400152064000P • 2800-40, 526561458315679609174359437760277084444444362800304128000P • 2800-40, 1053122916631359218348698875520554168888888725600608256000P • 2800-40, 2106245833262718436697397751041108337777777451201216512000P • 2800-40, 421249166652543687339479550208221675555555802402432320000P • 2800-40, 842498333305087374678959100416443351111111604804864640000P • 2800-40, 168499666661017474935791820083288670222222221217697281280000P • 2800-40, 33699933332203494987159364016657734044444444243539452560000P • 2800-40, 67399866664406989974318728033315468088888888487079905120000P • 2800-40, 134799733328013979948637456066630936177777777974159900240000P • 2800-40, 26959946665602795989727491213326187355555555948239900480000P • 2800-40, 53919893331205591979454982426653367111111118966479800960000P • 2800-40, 107839786662411183958909964853306742222222237932959601920000P • 2800-40, 215679573324822367917819929706613484444444758655919203840000P • 2800-40, 431359146649644735835639859413226968888889173311838407680000P • 2800-40, 862718293293289471671279718826453777777778346237676815360000P • 2800-40, 1725436586586578943342559537652907555555556892475353630720000P • 2800-40, 3450873173173157886685119175305815111111113784950707261440000P • 2800-40, 6901746346346315773370238350611630222222227569900141282880000P • 2800-40, 138034926926926315467404767012232604444444451399800282565760000P • 2800-40, 276069853853852630934809534024465208888888902799600565131520000P • 2800-40, 552139707707705261869619068048930417777777805599201131026240000P • 2800-40, 1104279415415410527339238136097860835555556111998402262052480000P • 2800-40, 22085588308308210546784762721957216711111112239968045241052480000P • 2800-40, 44171176616616421093569525443914433444444444479936090482052480000P
--	--

The Bulletin Board

BASIC FOUR		WANG		BORROWING		PRINTERS
	CONTROL DATA		QANTEL		TERMINALS	

The Bulletin Board

Our Low-Cost Way to Sell Your Equipment in Computerworld

What is The Bulletin Board?

We have a classified section designed to help you buy or sell individual software and hardware. It's especially suited to companies with a piece of used equipment for sale. For one low price, you can advertise to over half a million Computerworld readers nationwide.

How Does The Bulletin Board Work?

- The Bulletin Board is designed to advertise only one piece of equipment or software per unit.
- Units are one column wide by one inch deep at a cost of \$140.00 per column inch. Although several units may be purchased for one advertisement, there will be no quantity discount.
- All ads are standard in format and typeface. No special typeface, borders or logos are allowed. Copy may be up to 25 words per unit.
- The Bulletin Board ads are listed by manufacturer or by product type under appropriate headlines.
- Ads are set on a six-column page in our classified section under "The Bulletin Board".

How to Place an Ad in the Bulletin Board:

- We suggest you prepare your ad before contacting us. Here are some guidelines:
The first line is set in larger, bold type and should contain standard equipment identification.
The body copy should describe the equipment and state the price.
The closing should supply the seller's name and telephone number.
This is all the information an interested buyer needs for follow up.
- Ads are accepted by mail, phone or by telecopier.
- Deadline is 7 days in advance of Monday issue.
- If you have never advertised with Computerworld, we request a check with your order.
- The Bulletin Board ads are not agency commissionable nor may they be applied to contract advertisers inch count.
- We assume no liability for errors beyond the price of the ad.

Here's the Address and Phone.

The Bulletin Board
Classified Advertising
Computerworld
Box 880
Framingham, MA 01701
Toll-free (800) 343-6474
(In Mass., call 617-879-0700)

Published by CW Communications Inc., the world's leading publisher of computer related newspapers and magazines.

	SALVAGE		RISC SYSTEMS		DESK TOP COMPUTERS	
DATA GENERAL		TAPES		PERSON ELMER		MODEMS

HEWLETT PACKARD

HEWLETT PACKARD
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

COMPUTER NAME
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

NOX

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

SPERRY UNIVAC

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

DISK DRIVES AND PACKS

CDC DISK

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

HONEYWELL

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

IBM

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555
1982 • 800-555-5555

THE BIG THREE IN BUSINESS SOFTWARE. BEFORE YOU BUY, SEE HOW THEY RUN.



Run their general ledger. Their payroll/personnel. Their entire product line of financial and human resources software. Run the packages on your mainframe and link them to your PCs. Run them together and see if they work together.



You may well conclude that even though each of the big three has succeeded in business, only one of them has succeeded at integrating business application software.

And if your company size is \$100 million in sales or more, this discovery could spare you the pain of much lost time and money over the next few years. Because when you acquire a half dozen systems that fit together in name only—but not in fact—you face six times the training, six times the delay and six times the anxiety.

We believe your evaluation will show you this:

Two companies offer the mere appearance of integration. An agglomeration of business applications linked superficially. Through a web of hinges, patches, bridges, shadow files

and masks lurking just below the surface.

While one offers the real thing, Millennium. A true family of systems in which the whole works as smoothly as any part. In which every package has the same query mechanism, the same report writers, the same screen generation, the same on-line documentation, security and real-time capabilities. So that when the packages are put together, there are absolutely no borders between them. They fit like pieces in a jigsaw puzzle. Making the most efficient use of all your data processing resources.

There's even a Millennium application development tool, so you can create new systems as you need them. Without slow, expensive programming.

Millennium means integration in fact.

Not just in name.

And it is available only from McCormack & Dodge.

Of the big three in software, who's blind to integration and who's not?

When you see how they run, you'll know the answer.



MCCORMACK & DODGE